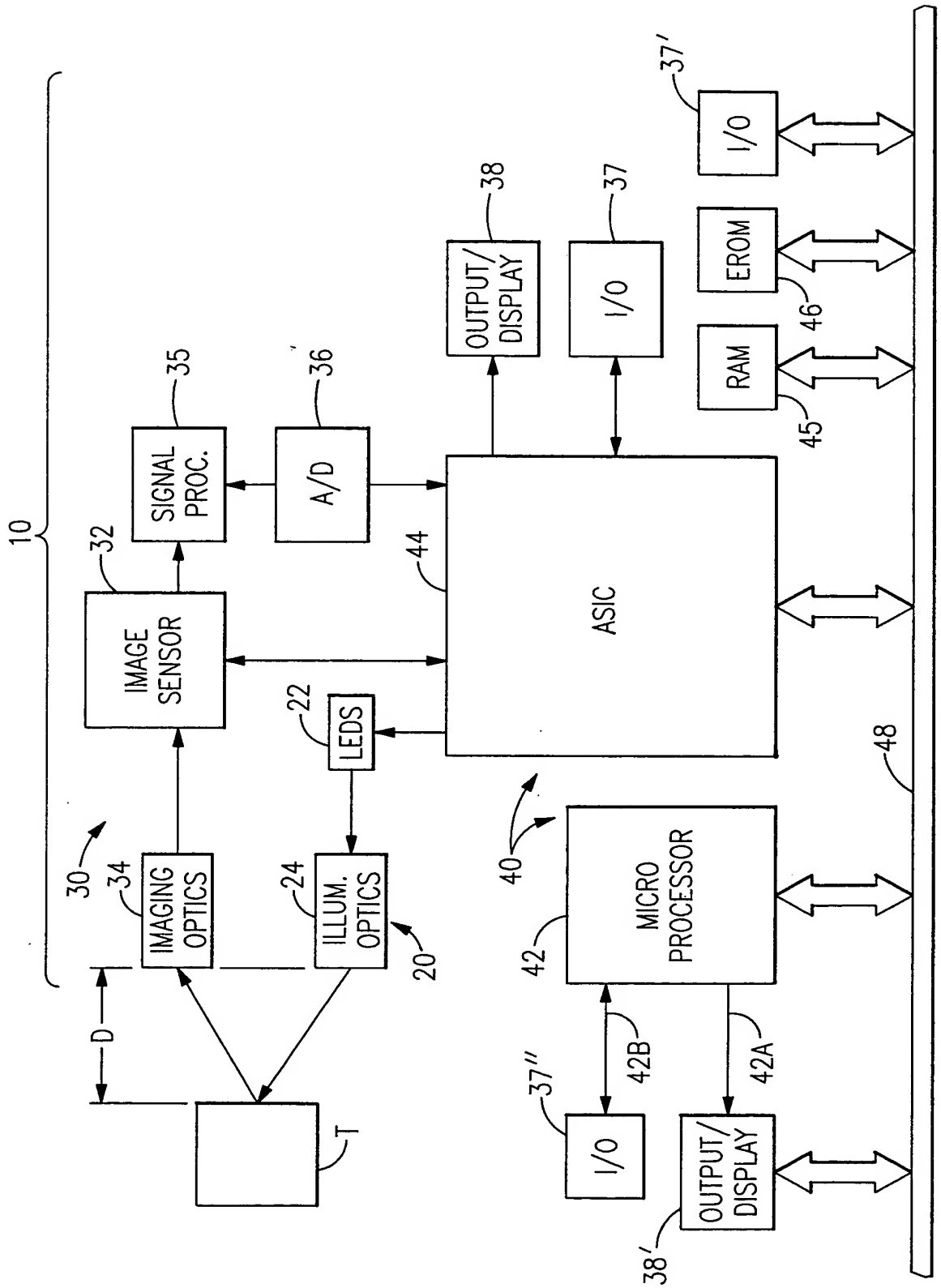
10
IMAGE SENSOR
32
SIGNAL PROC.
35
A/D
36
OUTPUT/ DISPLAY
38
I/O
37
I/O
37'
EROM
46
RAM
45
ASIC
44
LEDS
22
IMAGING OPTICS
34
ILLUM. OPTICS
24
20
30
D
T
MICRO PROCESSOR
42
40
I/O
37''
42B
42A
OUTPUT/ DISPLAY
38'
48

FIG.1

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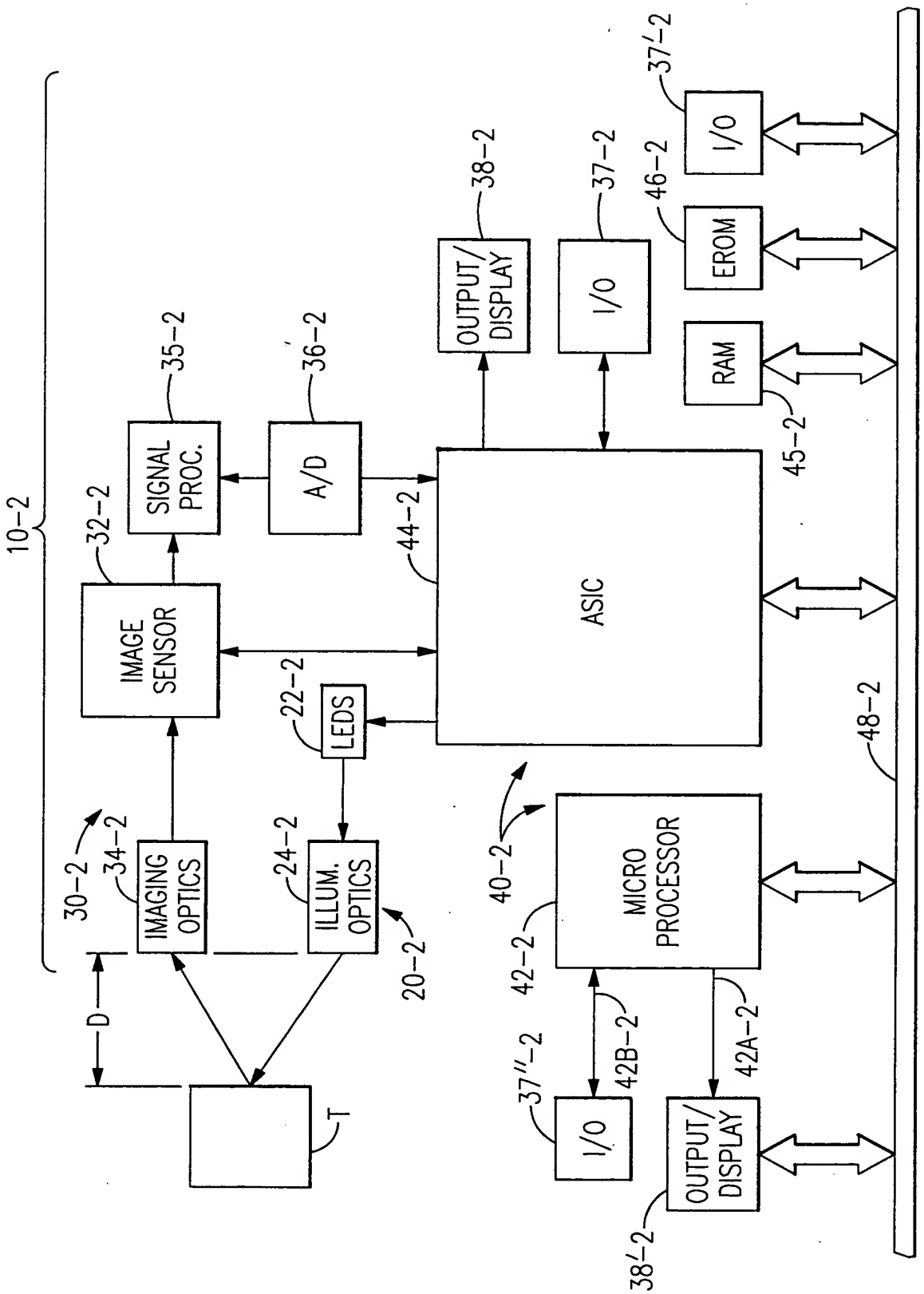

FIG.2

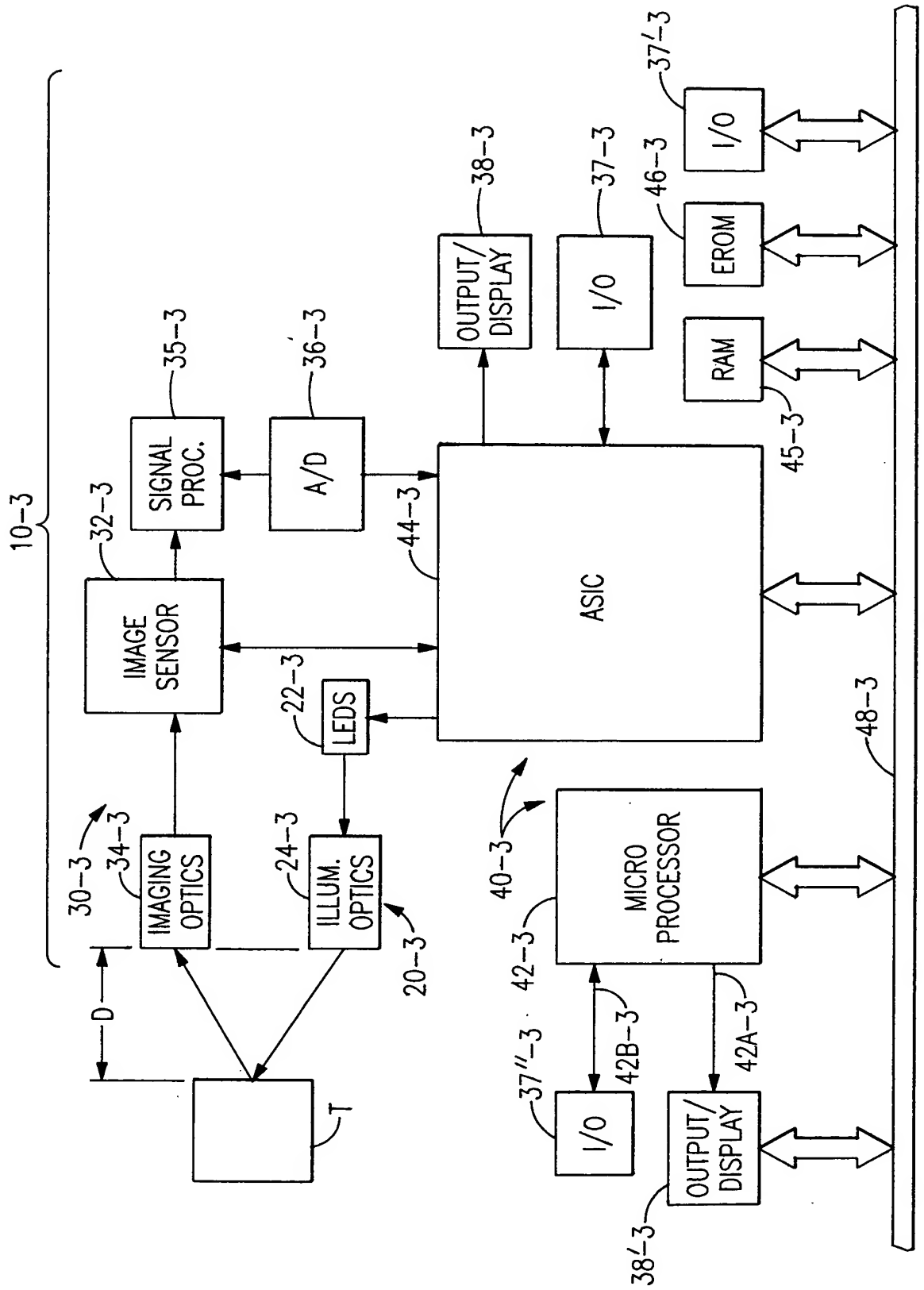
10-3
IMAGE SENSOR
32-3
SIGNAL PROC.
35-3
A/D
36-3
OUTPUT/ DISPLAY
38-3
I/O
37-3
EROM
46-3
I/O
37'-3
RAM
45-3
ASIC
44-3
LEDS
22-3
IMAGING OPTICS
34-3
30-3
ILLUM. OPTICS
24-3
20-3
D
T
MICRO PROCESSOR
40-3
42-3
48-3
I/O
37''-3
42B-3
OUTPUT/ DISPLAY
42A-3
38'-3

FIG.3

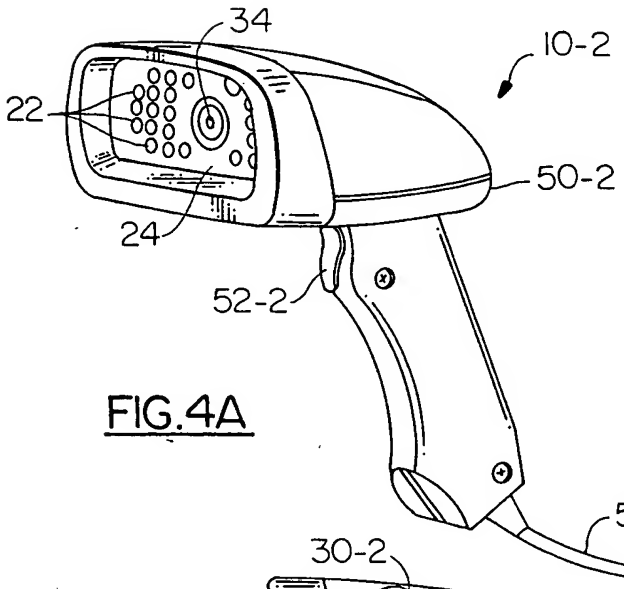

FIG.4A

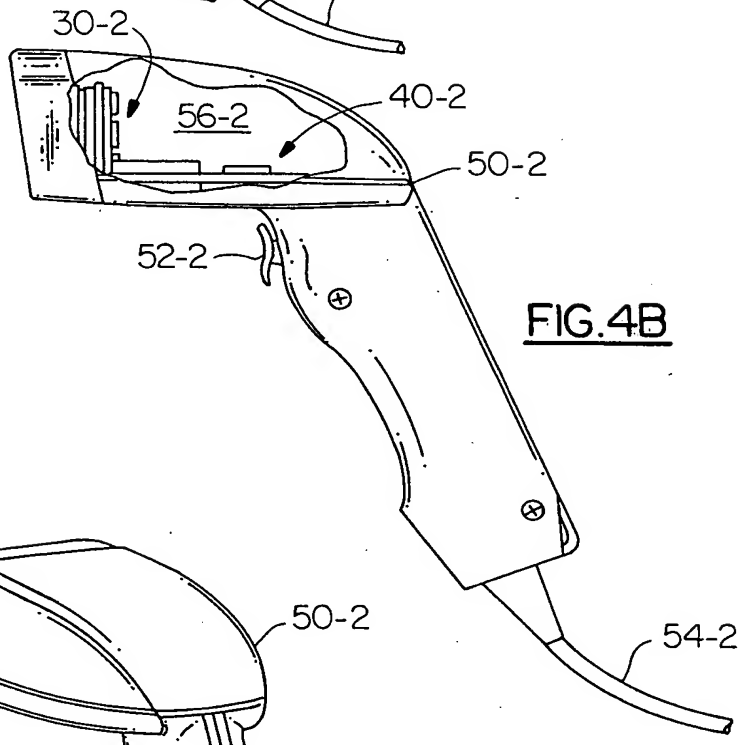

FIG.4B

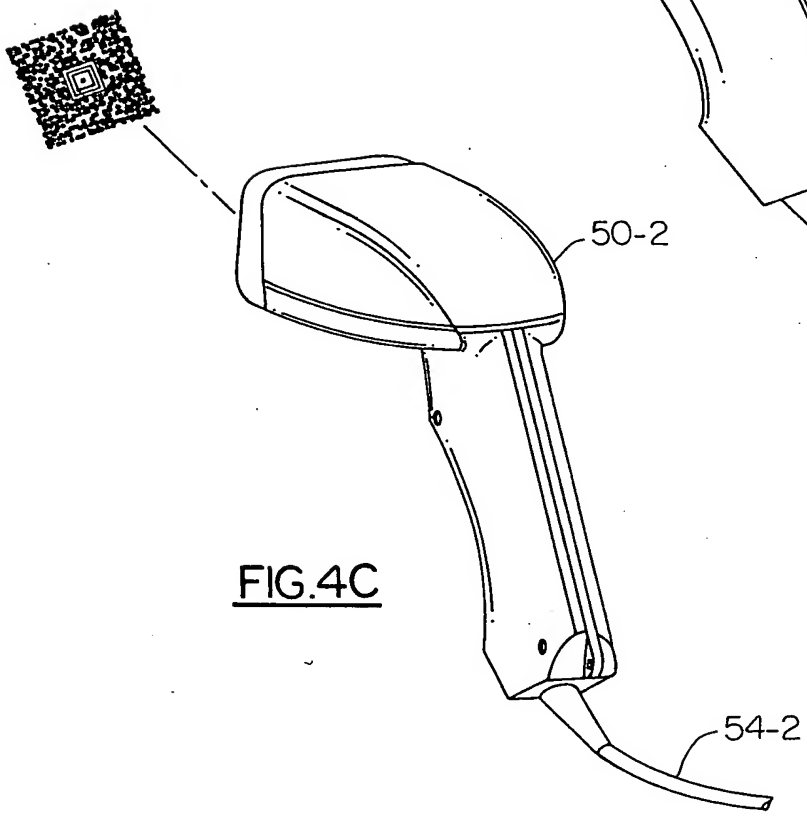

FIG.4C

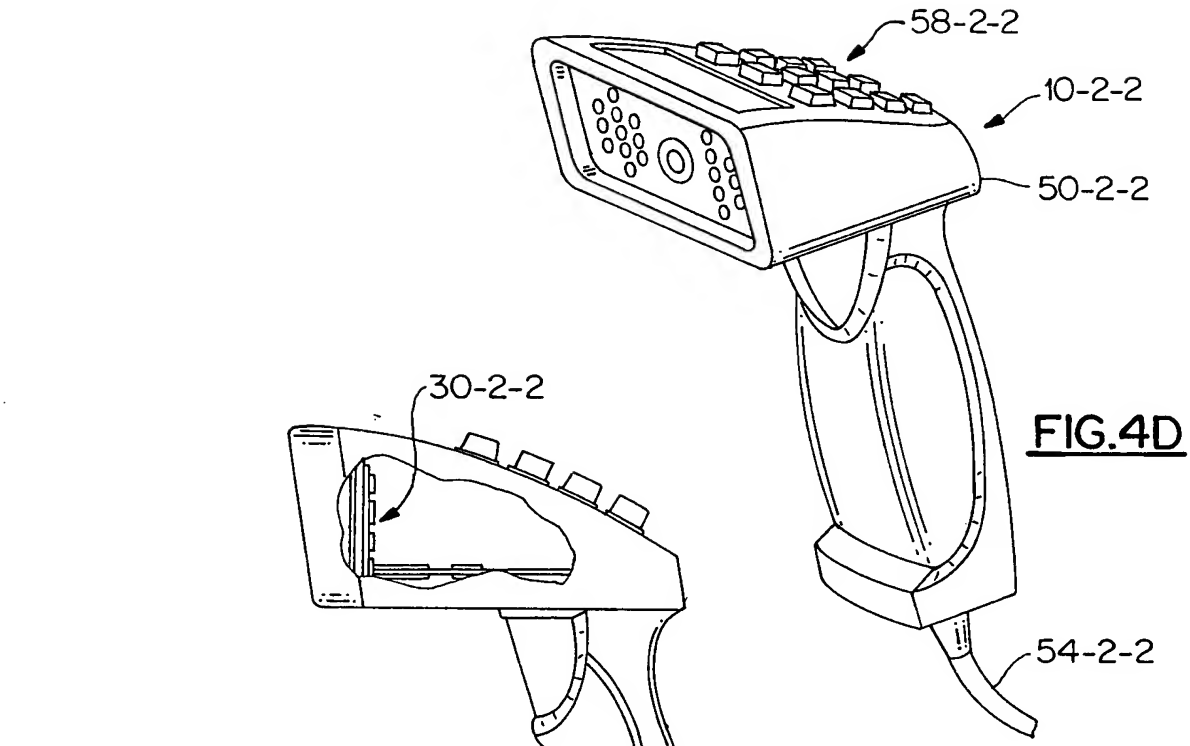

FIG.4D

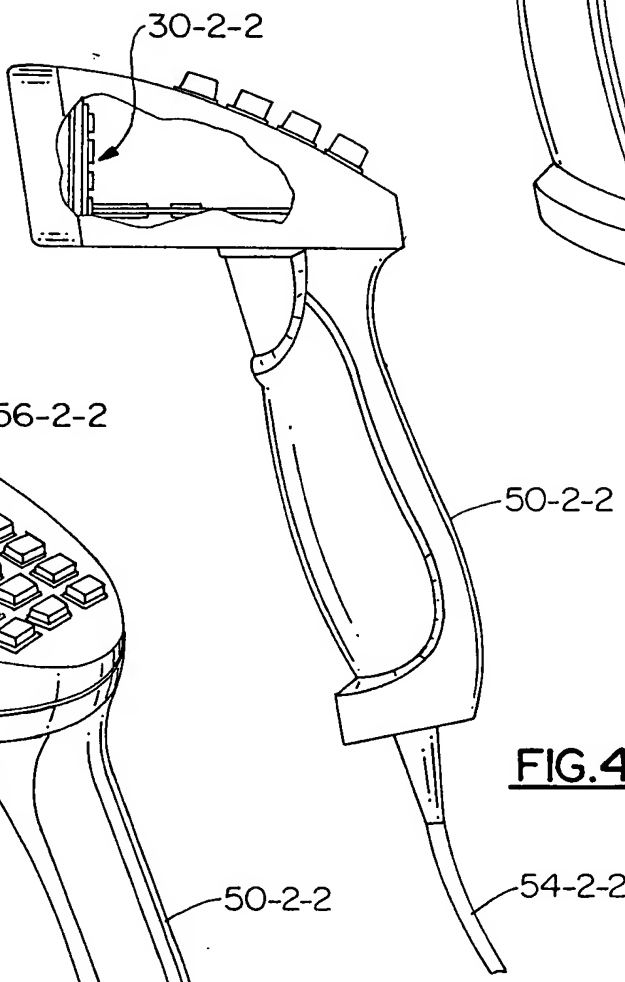

FIG.4E

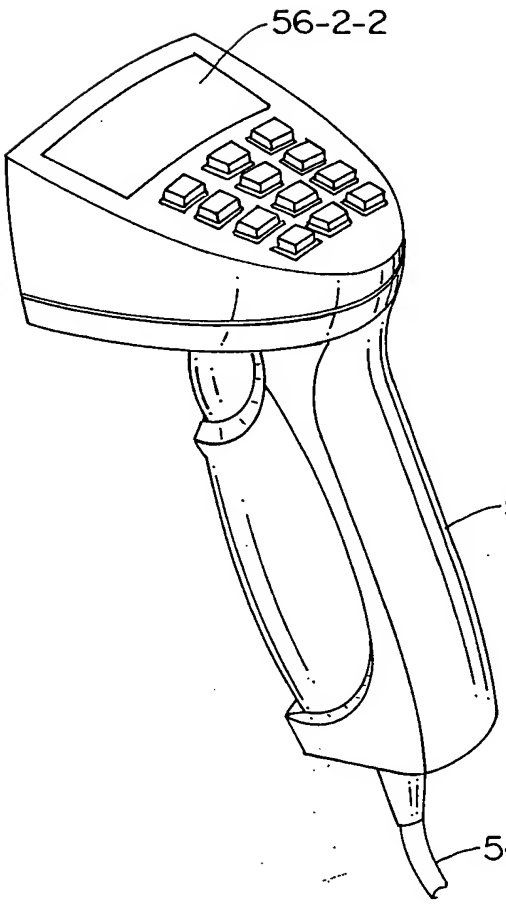

FIG.4F

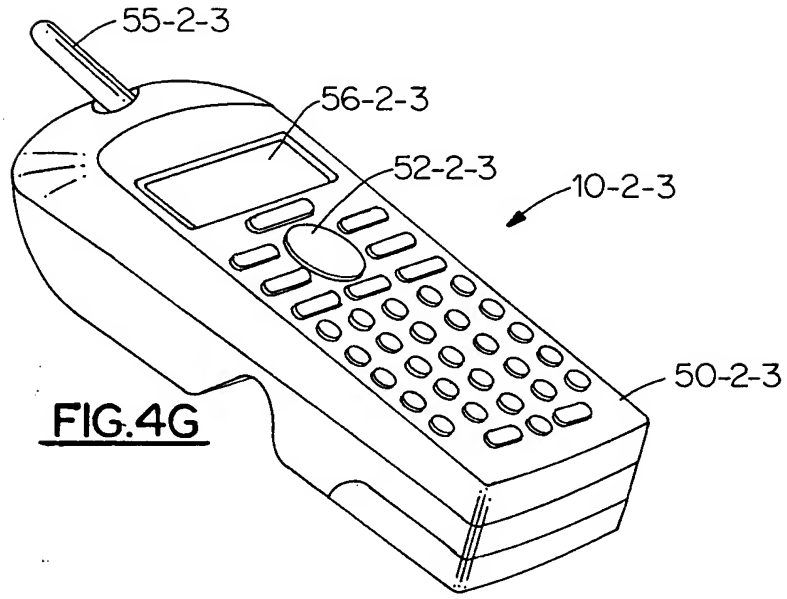

FIG.4G

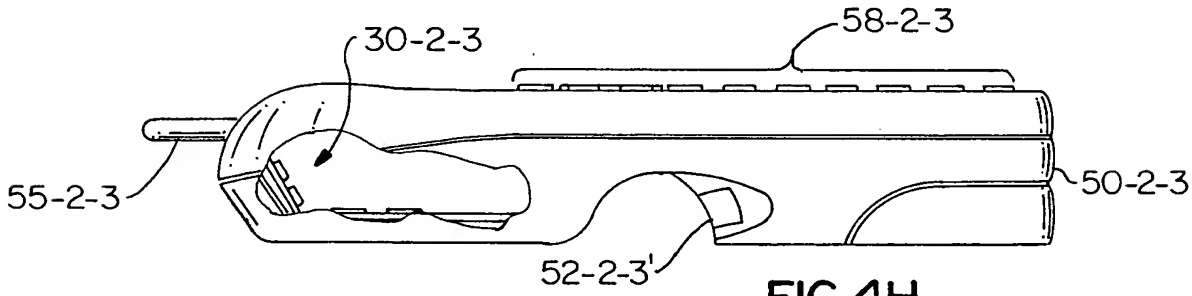

FIG.4H

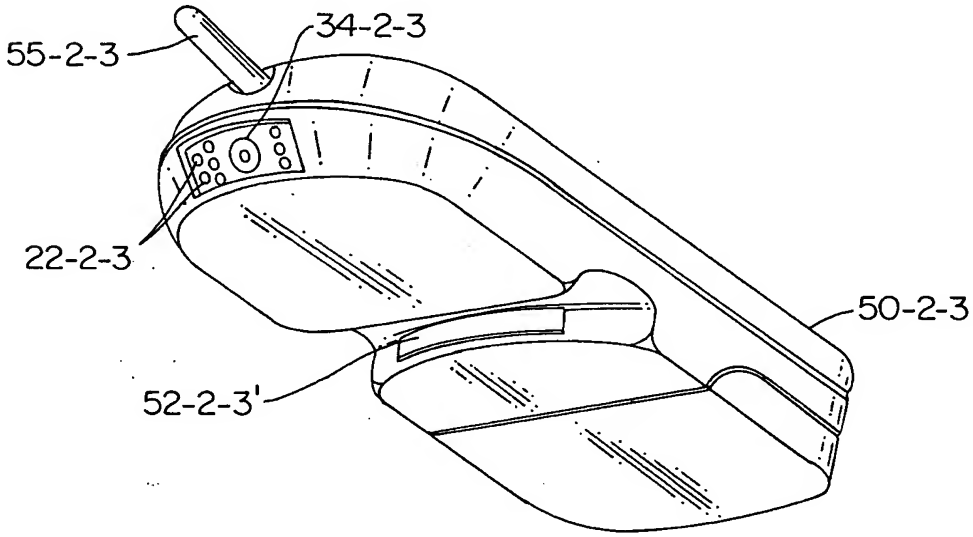

FIG.4I

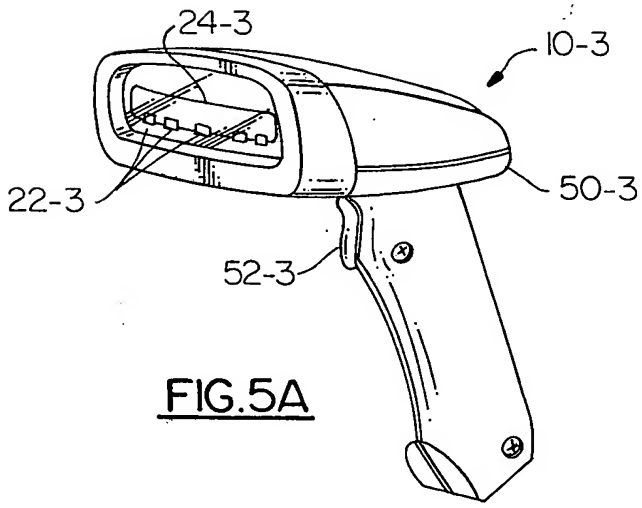

FIG.5A

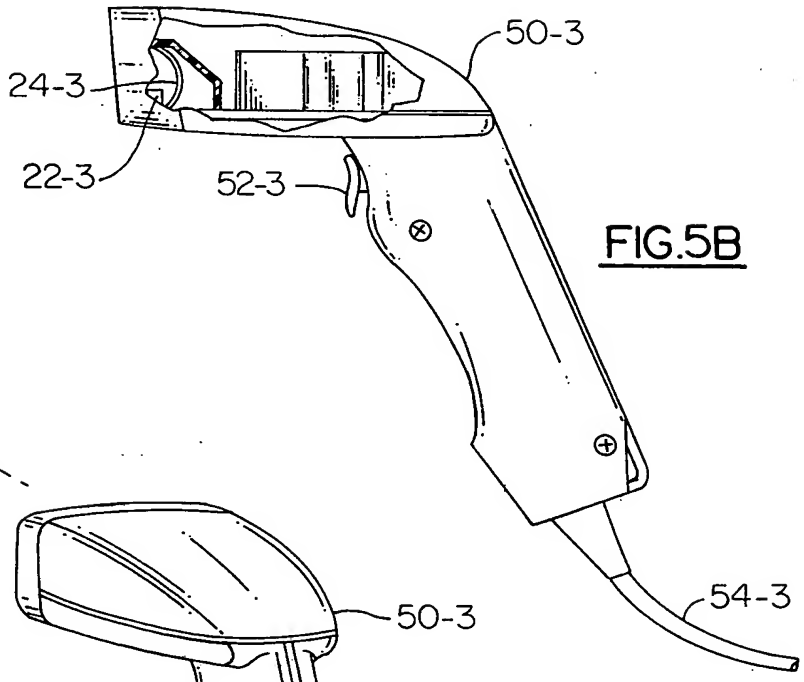

FIG.5B

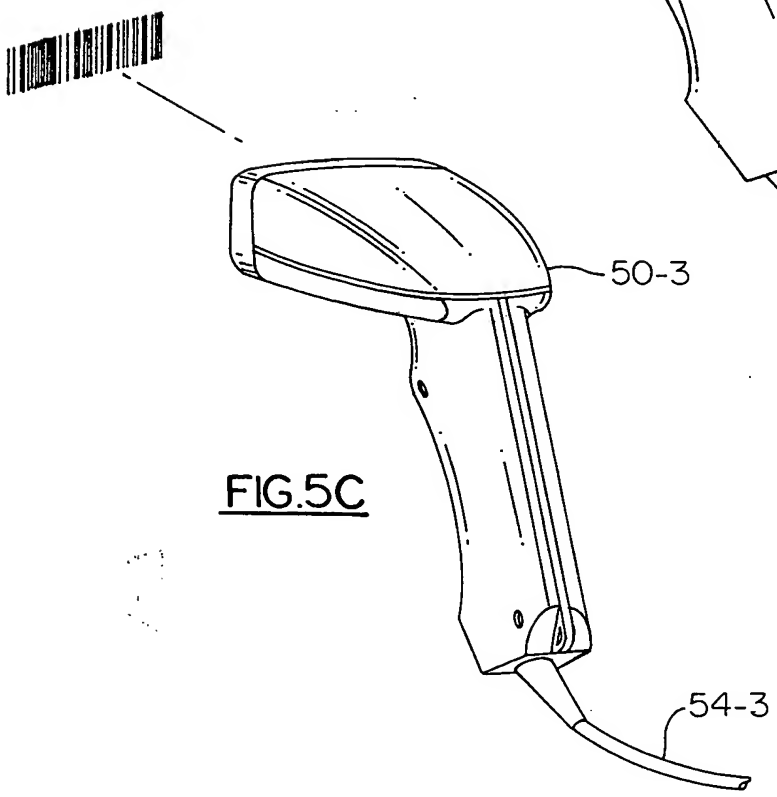

FIG.5C

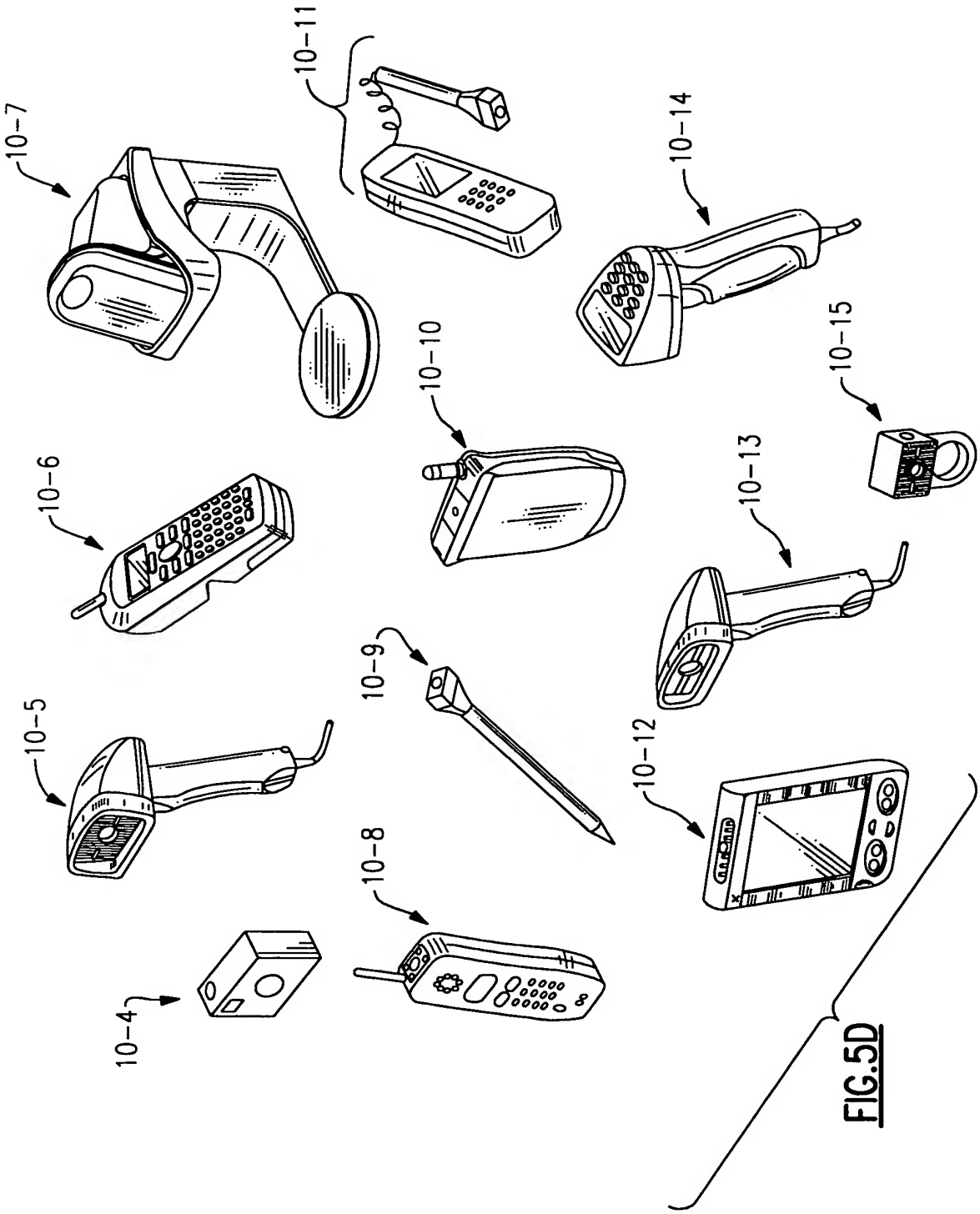

FIG.5D

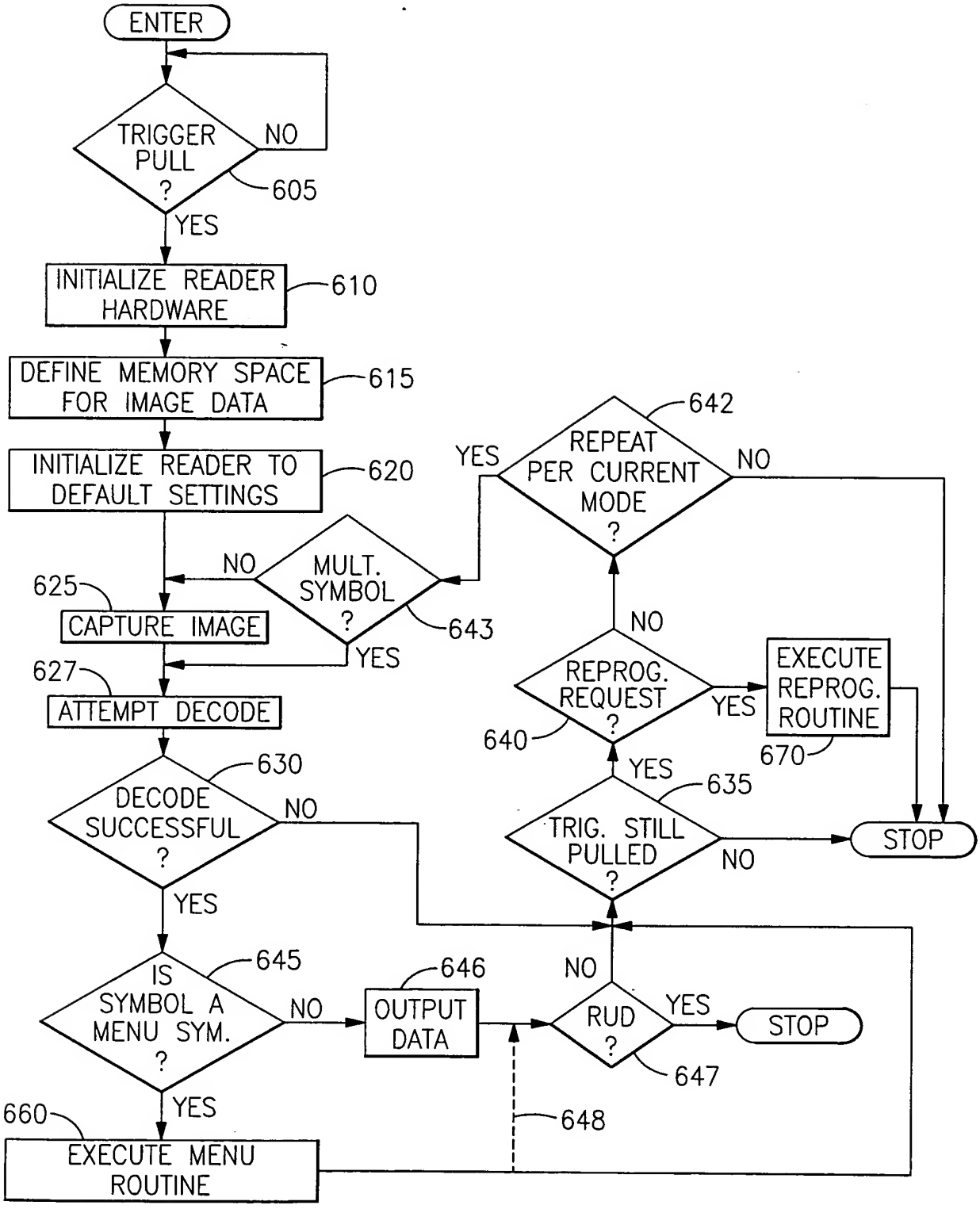
ENTER
TRIGGER PULL ?
NO
605
YES
INITIALIZE READER HARDWARE
610
DEFINE MEMORY SPACE FOR IMAGE DATA
615
INITIALIZE READER TO DEFAULT SETTINGS
620
625
CAPTURE IMAGE
627
ATTEMPT DECODE
DECODE SUCCESSFUL ?
630
NO
YES
IS SYMBOL A MENU SYM. ?
645
NO
YES
660
EXECUTE MENU ROUTINE
OUTPUT DATA
646
RUD ?
YES
STOP
647
NO
648
MULT. SYMBOL ?
643
NO
YES
REPEAT PER CURRENT MODE ?
642
YES
NO
REPROG. REQUEST ?
640
YES
EXECUTE REPROG. ROUTINE
670
NO
TRIG. STILL PULLED ?
635
YES
NO
STOP

FIG.6A

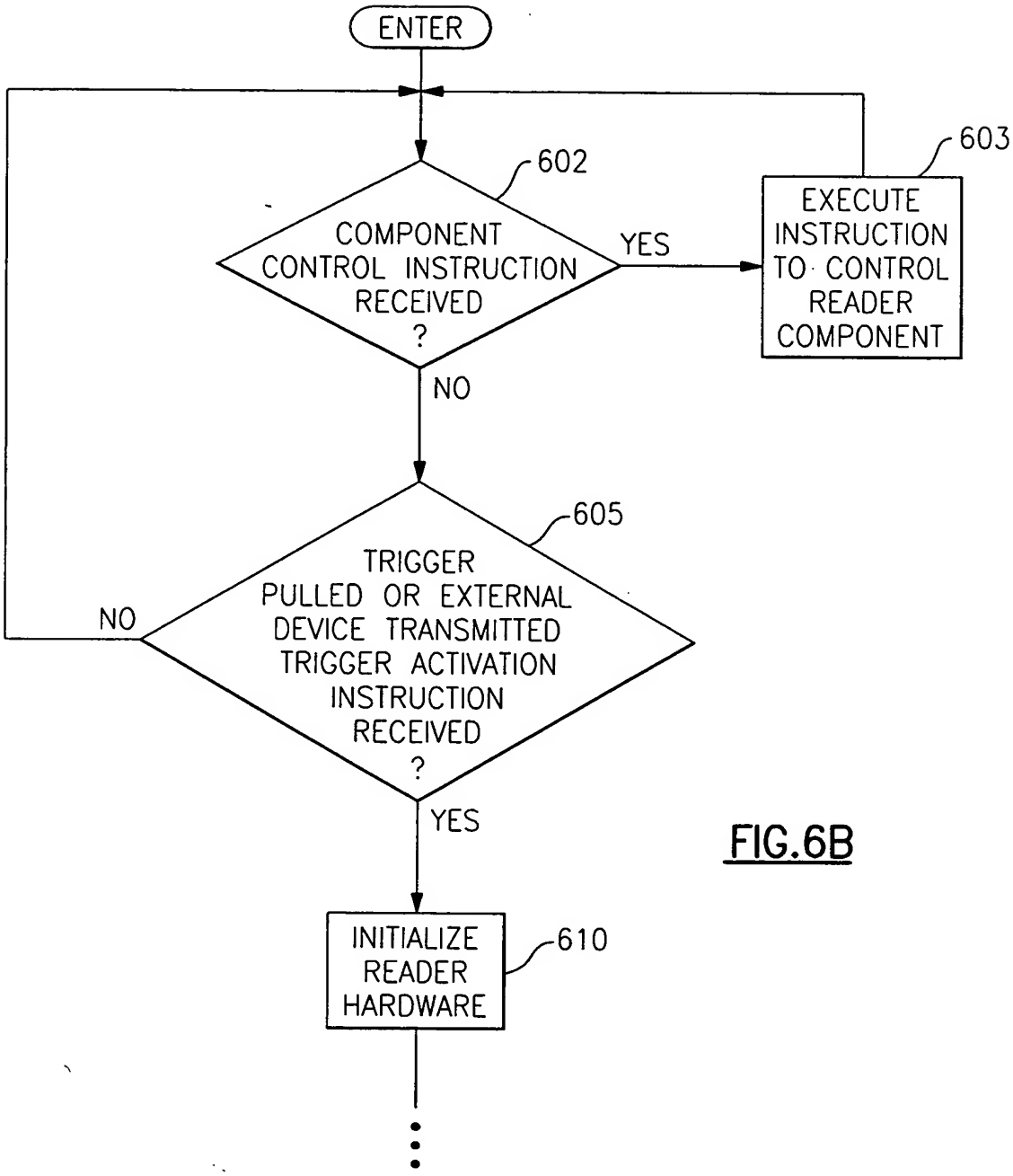
ENTER
602
COMPONENT CONTROL INSTRUCTION RECEIVED ?
YES
603
EXECUTE INSTRUCTION TO CONTROL READER COMPONENT
NO
605
TRIGGER PULLED OR EXTERNAL DEVICE TRANSMITTED TRIGGER ACTIVATION INSTRUCTION RECEIVED ?
NO
YES
INITIALIZE READER HARDWARE
610

FIG.6B

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Our Docket No.: 703-006.50.24
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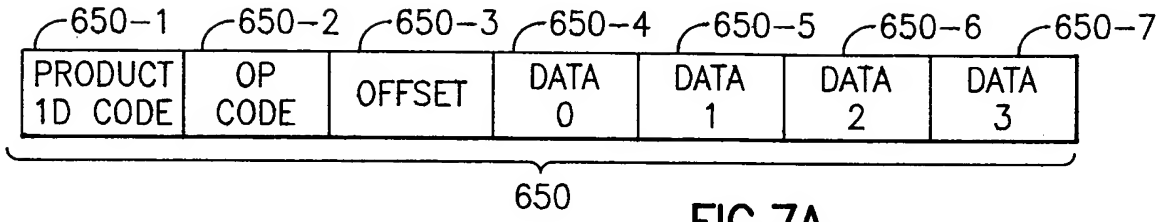


FIG.7A

OPTIONS (OFFSET) TABLE

A. COMMUNICATIONS OPTIONS
   1. RS-232
   2. BAUD RATE
   3. RF LINK
   4. ETHERNET
B. CODE OPTIONS
   1. DISABLE 1D
   2. DISABLE 2D
   3. DISABLE INDIV.
   4. MIN-MAX LENGTH
   5. MULTIPLE SYMBOLS ENABLED
C. SCANNING-DECODING OPTIONS
   1. ONE SHOT
   2. REPEAT UNTIL DONE
   3. REPEAT UNTIL STOPPED
   4. SCAN ON DEMAND
   5. SKIP SCAN
   6. DECODE ON DEMAND
D. OPERATING OPTIONS
   1. BEEPER VOLUME
   2. AIMING LED ON/OFF
   3. AURAL FEEDBACK
E. TRANSMIT OPTIONS
   1. SEND CHECK CHAR'S
   2. SEND CHECKSUM
   3. DATA EDIT OPTIONS

FIG.7B

OP CODE TABLE

A. OP CODE "0"-VECTOR PROC.
   1. OUTPUT VERSION OF SOFTWARE
   2. OUTPUT CONTENTS OF PARAMETER TABLE
   3. DISPLAY ENABLED CODES
   4. PRINT PARAMETER TABLE AS BAR CODE SYMBOL
B. OP CODE "1" - CLEAR
C. OP CODE "2" - SET
D. OP CODE "3" - TOGGLE
E. OP CODE "4" - ADD
F. OP CODE "5" - DEFAULT
G. OP CODE "6" - LOAD
H. OP CODE "7" - RESERVED

FIG.7C

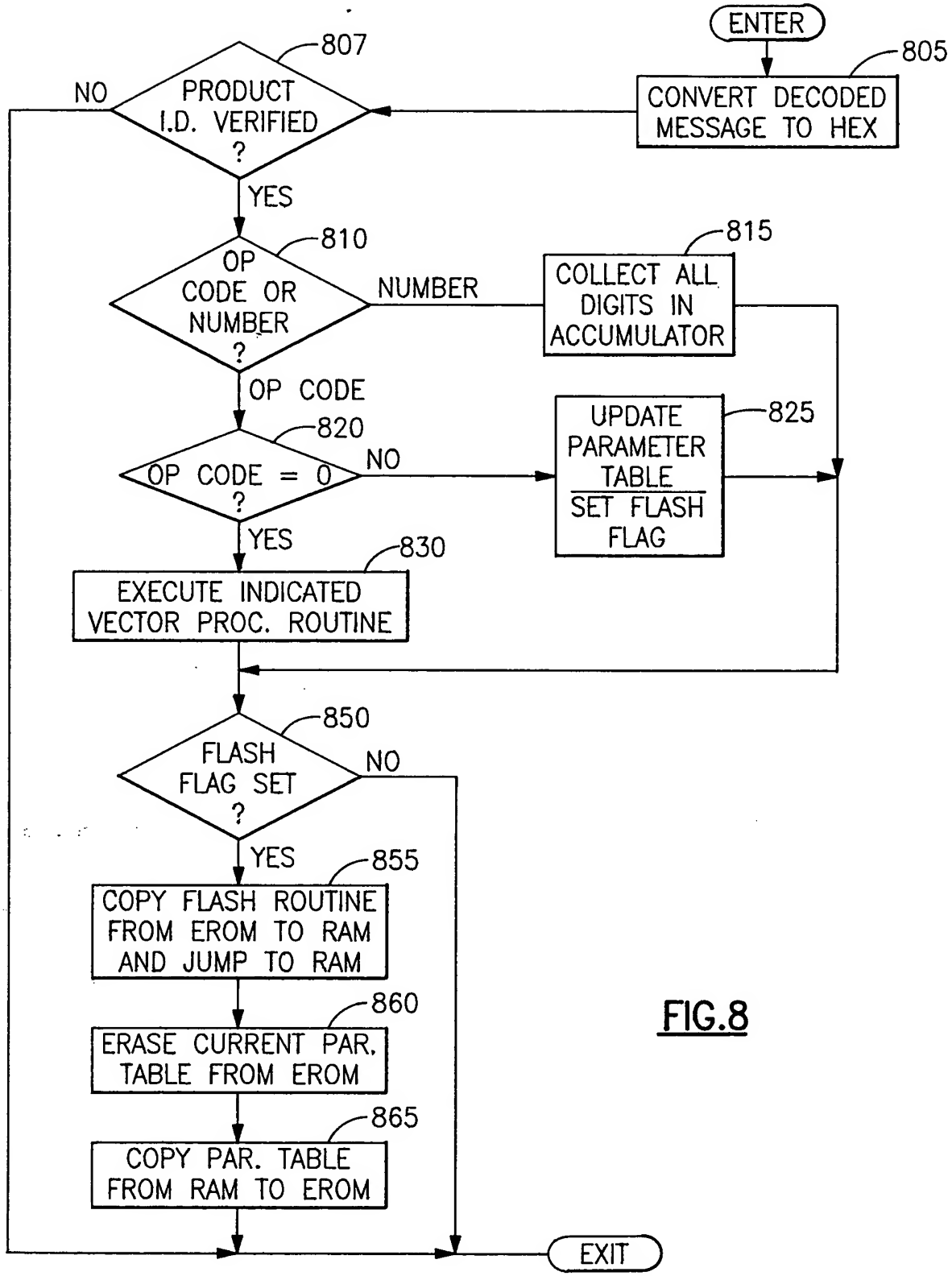
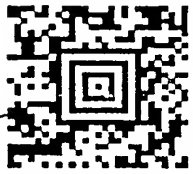
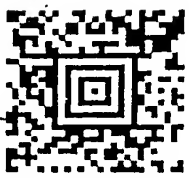

ENTER
805
CONVERT DECODED MESSAGE TO HEX
807
PRODUCT I.D. VERIFIED ?
NO
YES
810
OP CODE OR NUMBER ?
NUMBER
815
COLLECT ALL DIGITS IN ACCUMULATOR
OP CODE
820
OP CODE = 0 ?
NO
825
UPDATE PARAMETER TABLE
SET FLASH FLAG
YES
830
EXECUTE INDICATED VECTOR PROC. ROUTINE
850
FLASH FLAG SET ?
NO
YES
855
COPY FLASH ROUTINE FROM EROM TO RAM AND JUMP TO RAM
860
ERASE CURRENT PAR. TABLE FROM EROM
865
COPY PAR. TABLE FROM RAM TO EROM
EXIT

FIG.8

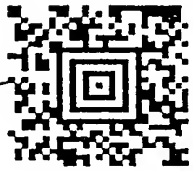
FIG.8A

CODE 128 SELECTION

802 
*ON

804 
OFF

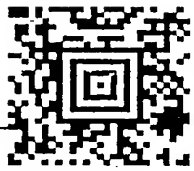
UPC A SELECTION

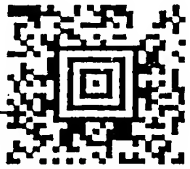
806 
*ON

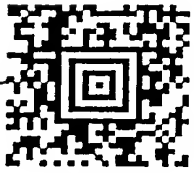
808
OFF

FIG.8B

BAUD RATE SELECTION

812 
1200

814 
9600

816 
19200

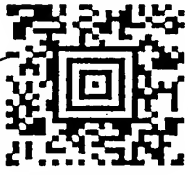
818 
*38400

FIG.8C

DEFAULT ALL CODE 11/CODE 128 SETTINGS

822

CODE 11 SELECTION

824 *ON

CODE 11

826 OFF

828 *2 CHECK DIGITS

CHECK DIGITS REQUIRED

832 1 CHECK DIGIT

834 MINIMUM ‡

MESSAGE LENGTH

836 MAXIMUM ‡

CODE 128 SELECTION

848 *ON

CODE 128

852 OFF

854 MINIMUM ‡

MESSAGE LENGTH

856 MAXIMUM ‡

‡ A TWO-DIGIT NUMBER IS REQUIRED AFTER SCANNING THIS PROGRAMMING BAR CODE. PLEASE SCAN YOUR SELECTION ON THE PROGRAMMING CHART (INSIDE BACK COVER).

FIG.8D

RS-232D PORT 2 (D OUTPUT)

DEFAULT ALL RS-232 PORT 2 SETTINGS

858

CTS CHECK SELECTION

862 ENABLE

864 *DISABLE

BAUD RATE SELECTION

866 300

868 600

872 1200

874 2400

876 4800

878 *9600

882 19200

884 38400

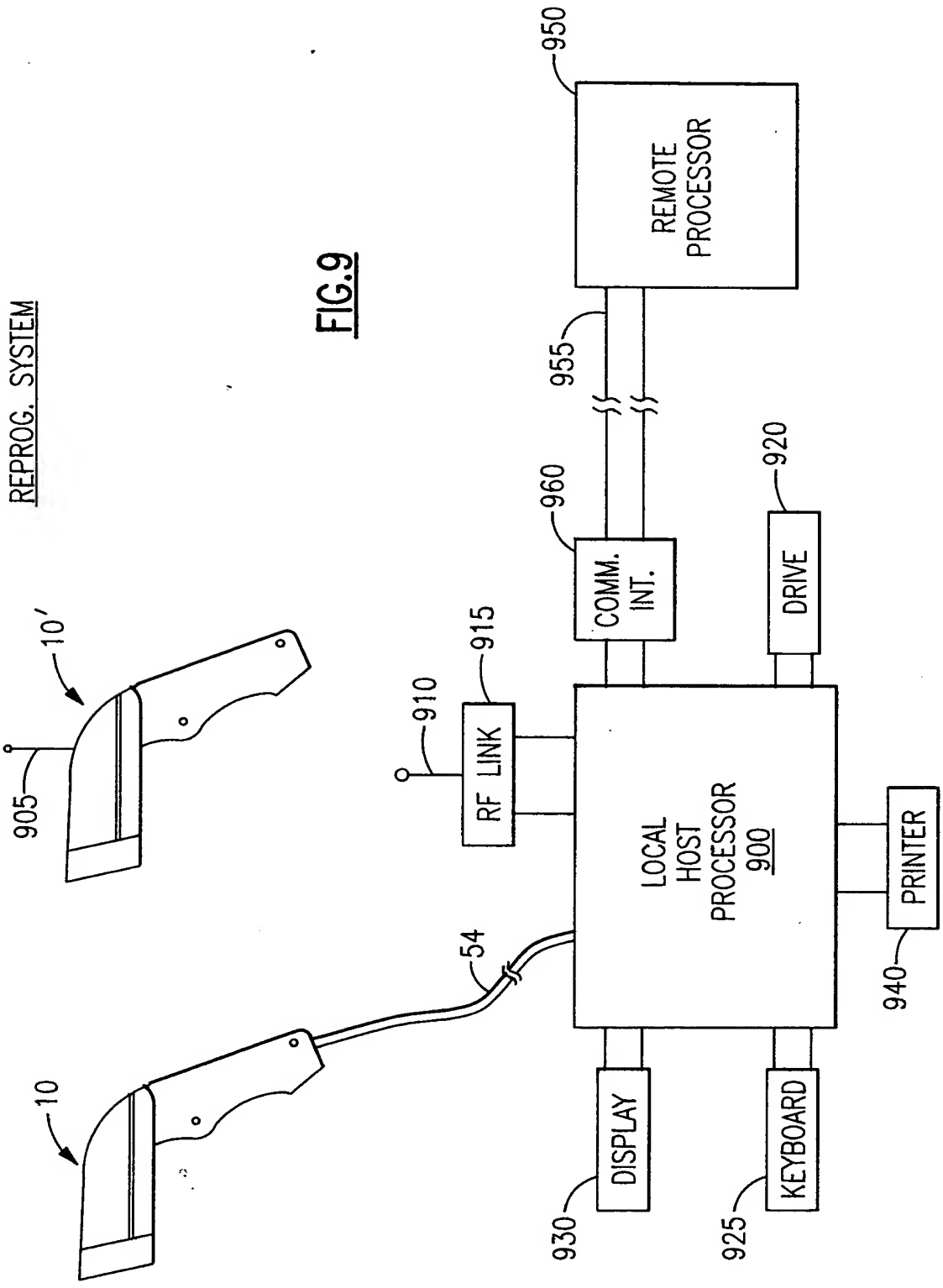

REPROG. SYSTEM
10'
905
10
54
950
REMOTE PROCESSOR
955
960
COMM. INT.
920
DRIVE
915
910
RF LINK
LOCAL HOST PROCESSOR 900
PRINTER
940
DISPLAY
930
KEYBOARD
925

FIG.9

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Telephone: (315) 425-9000

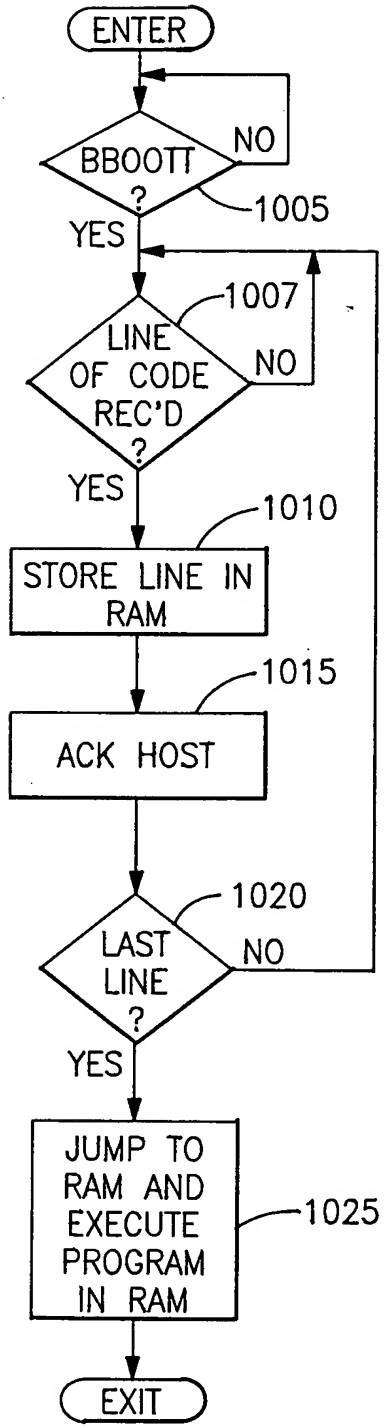

FIG. 10A

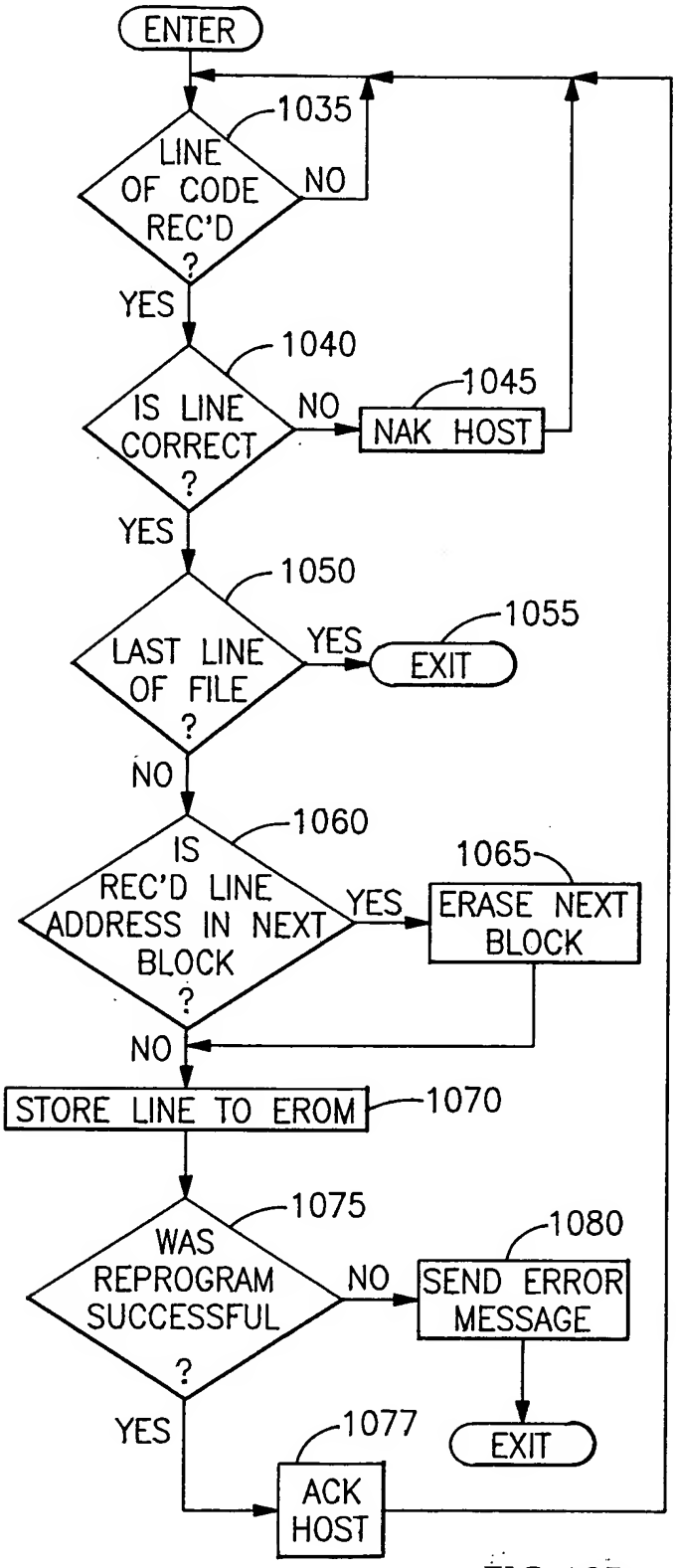

FIG 10B

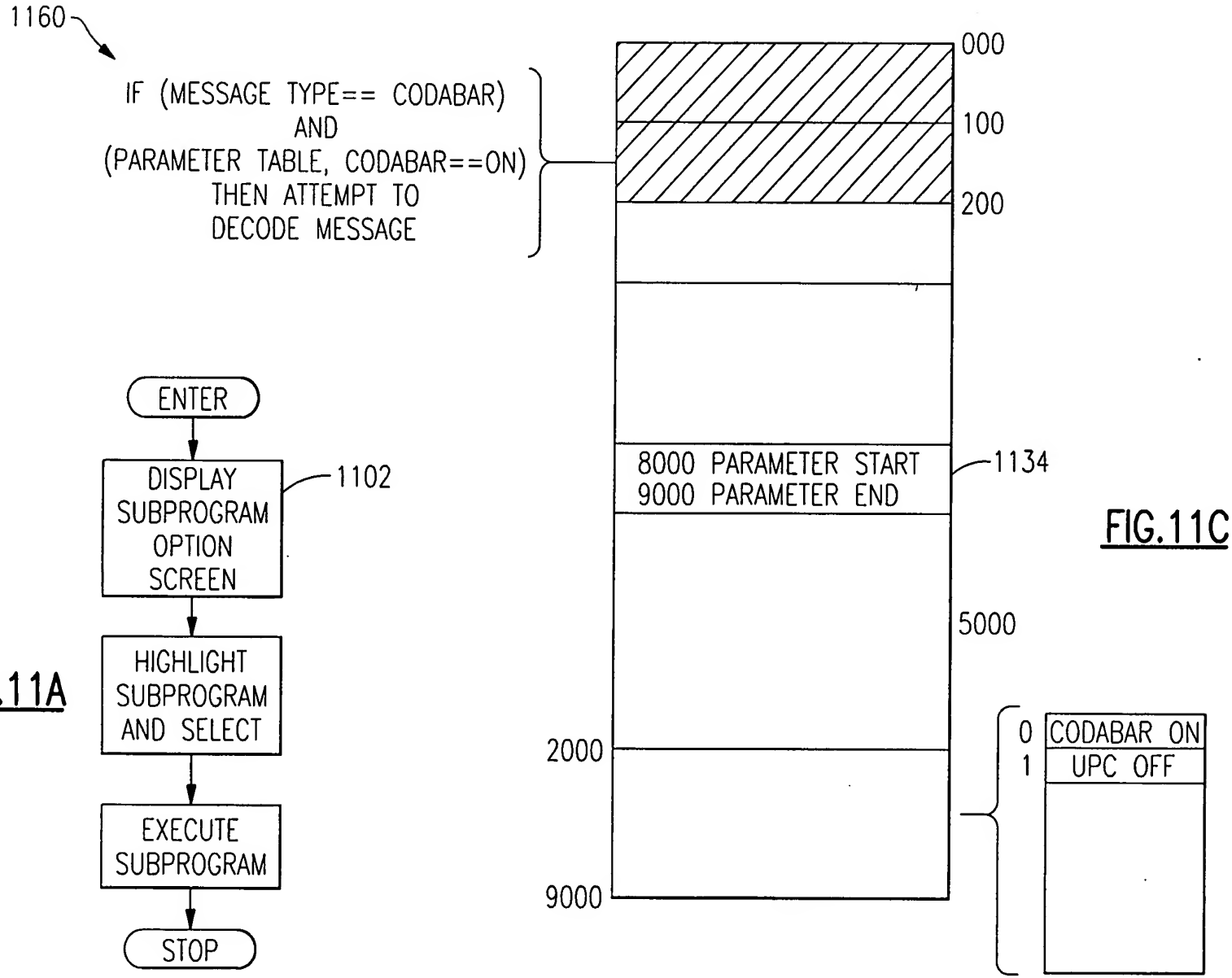

FIG.11A

FIG.11C

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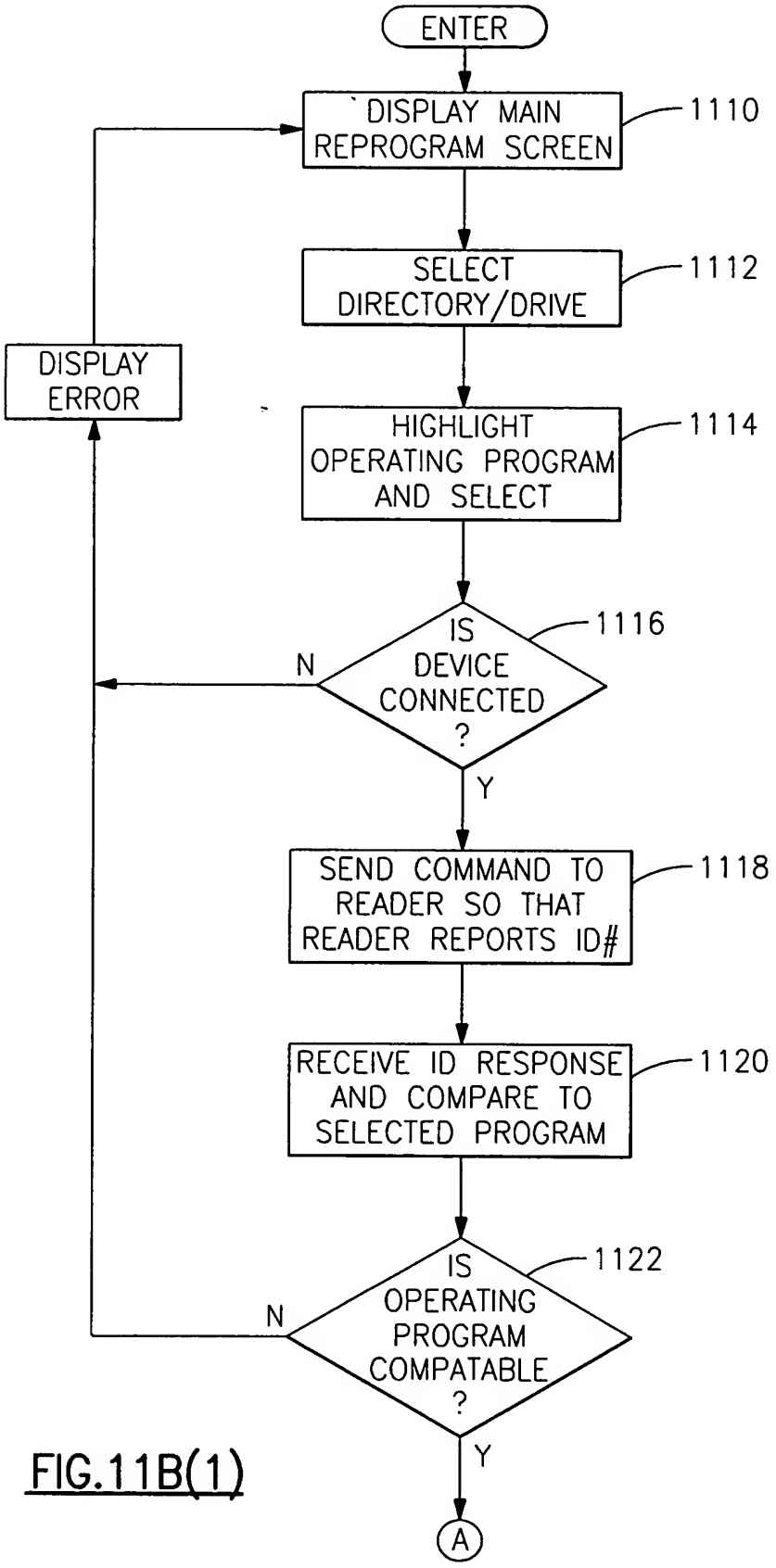


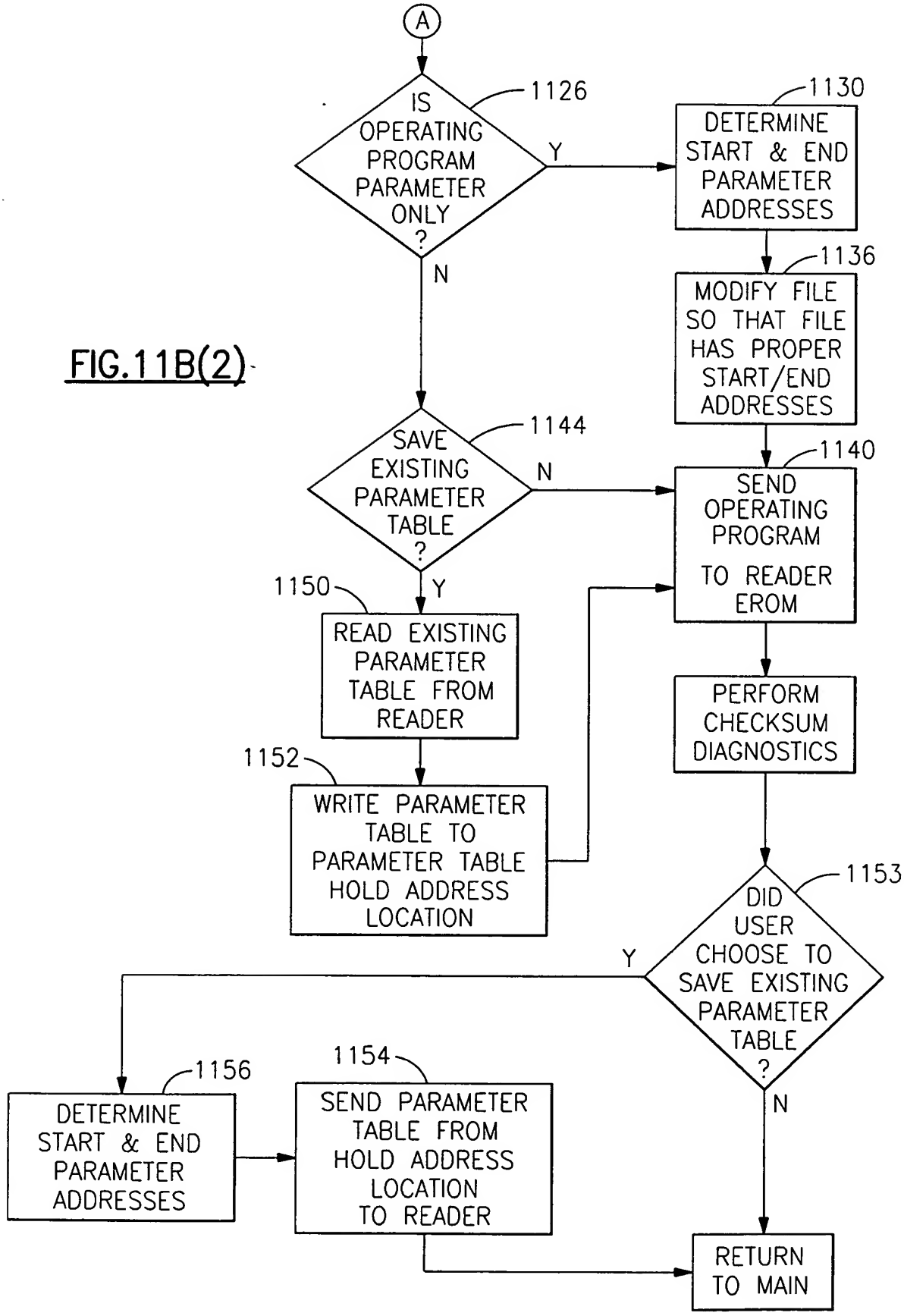
FIG. 11B(1)

FIG. 11B(2)

FIG. 11B

FIG. 11B(1)

FIG.11B(2)


A
IS OPERATING PROGRAM PARAMETER ONLY ?
1126
Y
N
DETERMINE START & END PARAMETER ADDRESSES
1130
MODIFY FILE SO THAT FILE HAS PROPER START/END ADDRESSES
1136
SAVE EXISTING PARAMETER TABLE ?
1144
N
Y
SEND OPERATING PROGRAM TO READER EROM
1140
READ EXISTING PARAMETER TABLE FROM READER
1150
WRITE PARAMETER TABLE TO PARAMETER TABLE HOLD ADDRESS LOCATION
1152
PERFORM CHECKSUM DIAGNOSTICS
DID USER CHOOSE TO SAVE EXISTING PARAMETER TABLE ?
1153
Y
N
DETERMINE START & END PARAMETER ADDRESSES
1156
SEND PARAMETER TABLE FROM HOLD ADDRESS LOCATION TO READER
1154
RETURN TO MAIN

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Andrew Longacre, Jr. et al.
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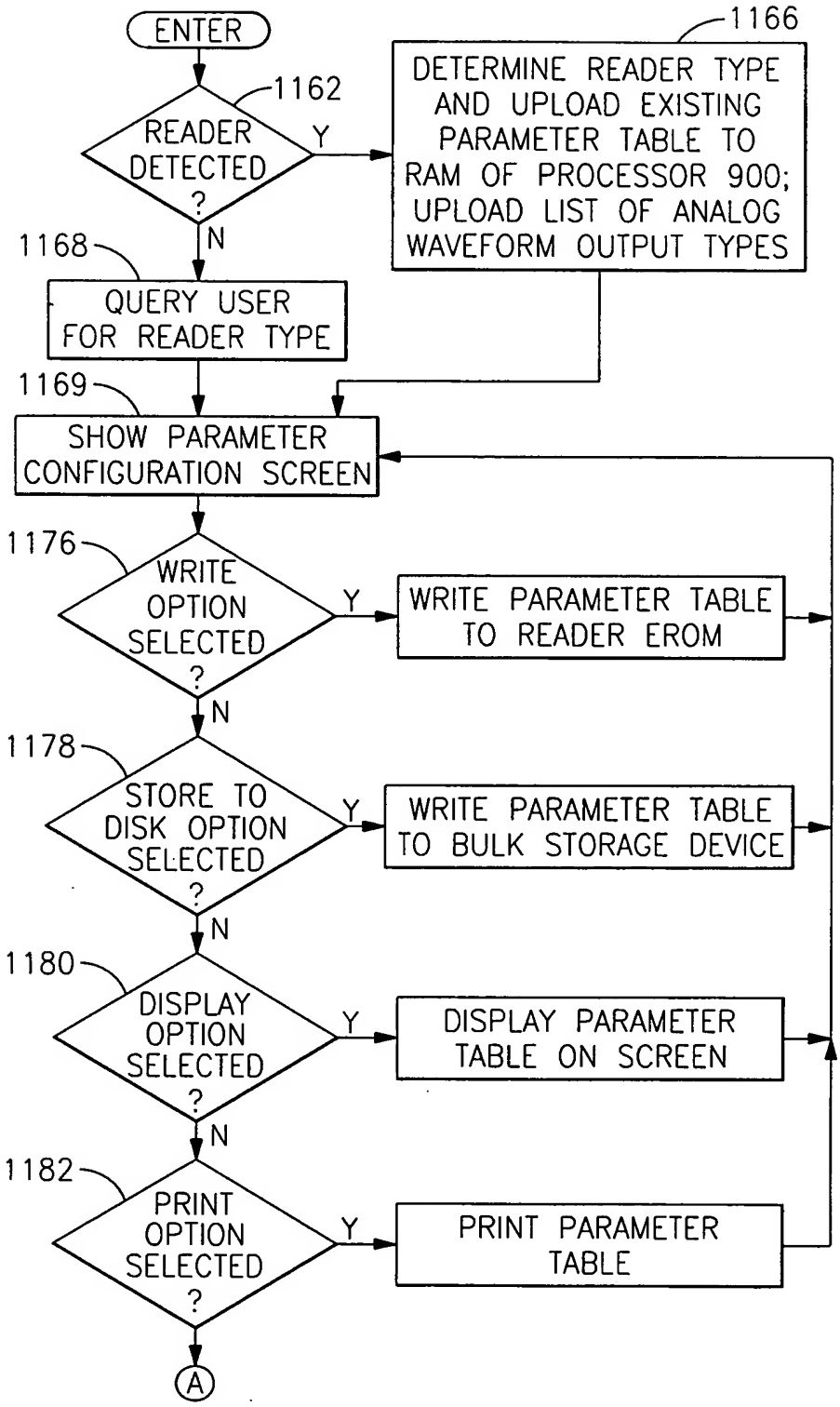
Our Docket No.: 703-006.50.24
Telephone: (315) 425-9000

FIG. 11D(1)

FIG. 11D(2)

FIG.11D



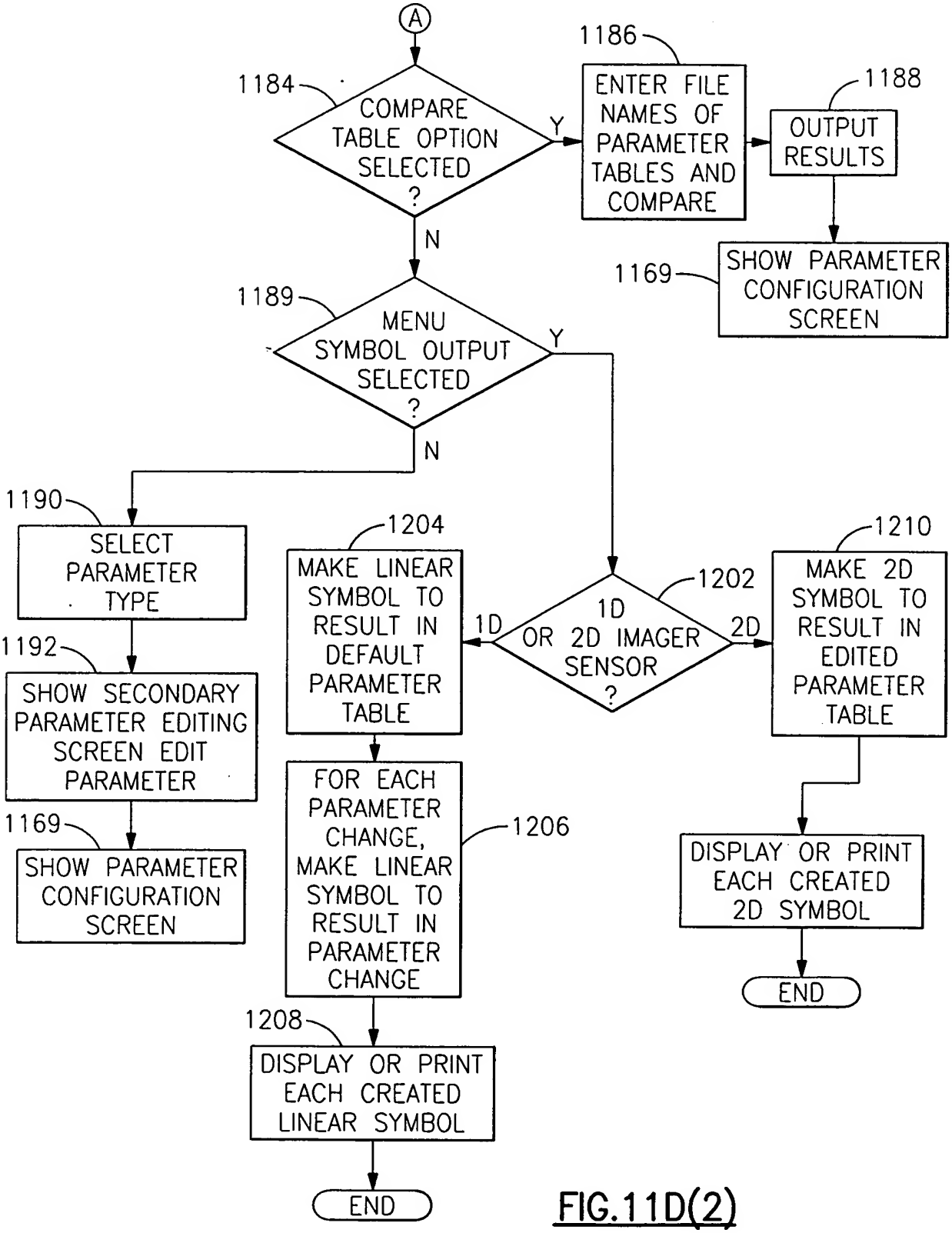

A
1184
COMPARE TABLE OPTION SELECTED ?
Y
1186
ENTER FILE NAMES OF PARAMETER TABLES AND COMPARE
1188
OUTPUT RESULTS
1169
SHOW PARAMETER CONFIGURATION SCREEN
N
1189
MENU SYMBOL OUTPUT SELECTED ?
Y
N
1190
SELECT PARAMETER TYPE
1192
SHOW SECONDARY PARAMETER EDITING SCREEN EDIT PARAMETER
1169
SHOW PARAMETER CONFIGURATION SCREEN
1204
MAKE LINEAR SYMBOL TO RESULT IN DEFAULT PARAMETER TABLE
1202
1D OR 2D IMAGER SENSOR ?
1D
2D
1210
MAKE 2D SYMBOL TO RESULT IN EDITED PARAMETER TABLE
FOR EACH PARAMETER CHANGE, MAKE LINEAR SYMBOL TO RESULT IN PARAMETER CHANGE
1206
DISPLAY OR PRINT EACH CREATED 2D SYMBOL
END
1208
DISPLAY OR PRINT EACH CREATED LINEAR SYMBOL
END

FIG.11D(2)

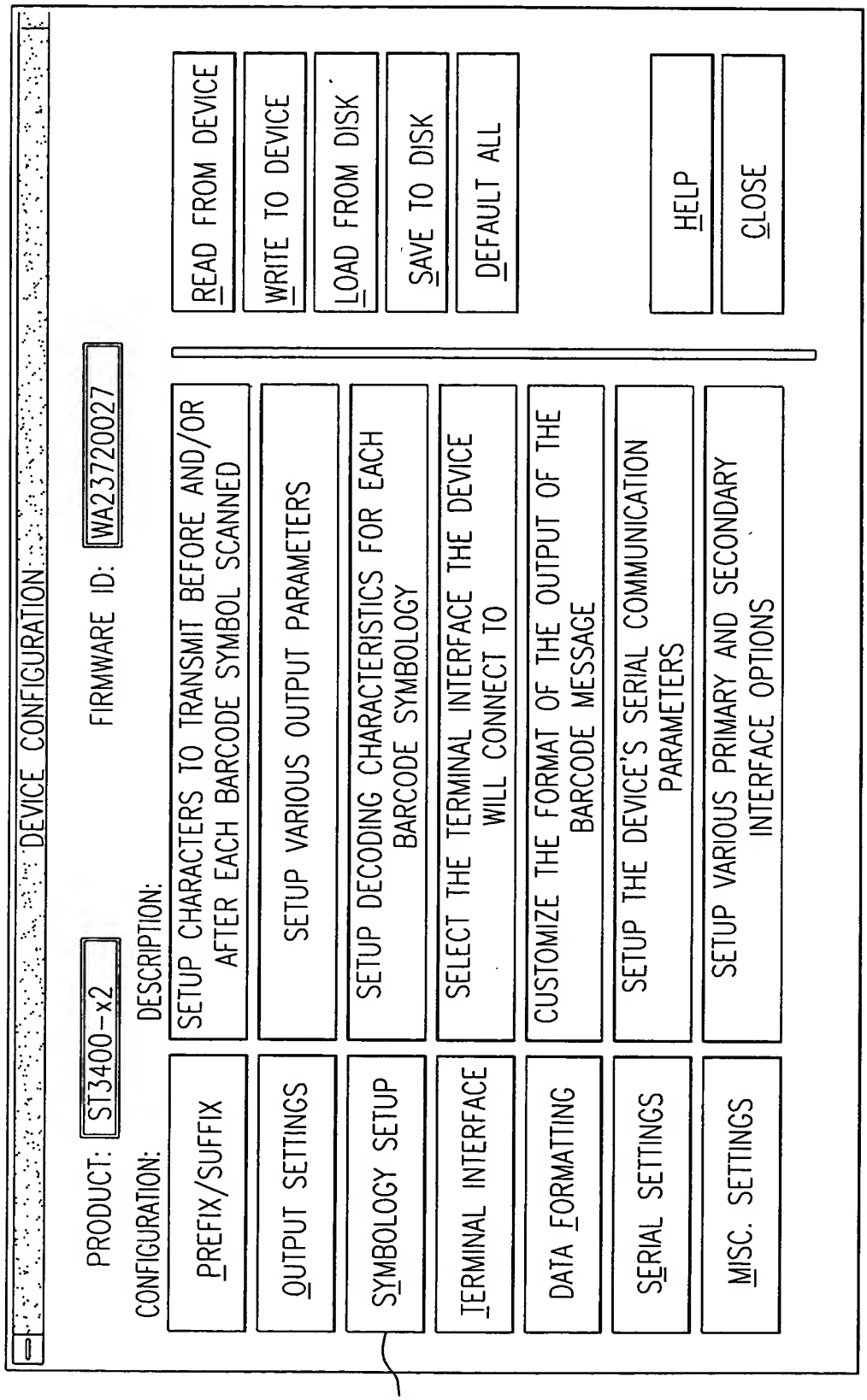

DEVICE CONFIGURATION
PRODUCT: ST3400-x2
FIRMWARE ID: WA23720027
CONFIGURATION:
DESCRIPTION:
PREFIX/SUFFIX
OUTPUT SETTINGS
SYMBOLOGY SETUP
TERMINAL INTERFACE
DATA FORMATTING
SERIAL SETTINGS
MISC. SETTINGS
SETUP CHARACTERS TO TRANSMIT BEFORE AND/OR AFTER EACH BARCODE SYMBOL SCANNED
SETUP VARIOUS OUTPUT PARAMETERS
SETUP DECODING CHARACTERISTICS FOR EACH BARCODE SYMBOLOGY
SELECT THE TERMINAL INTERFACE THE DEVICE WILL CONNECT TO
CUSTOMIZE THE FORMAT OF THE OUTPUT OF THE BARCODE MESSAGE
SETUP THE DEVICE'S SERIAL COMMUNICATION PARAMETERS
SETUP VARIOUS PRIMARY AND SECONDARY INTERFACE OPTIONS
READ FROM DEVICE
WRITE TO DEVICE
LOAD FROM DISK
SAVE TO DISK
DEFAULT ALL
HELP
CLOSE
1174

FIG.11E

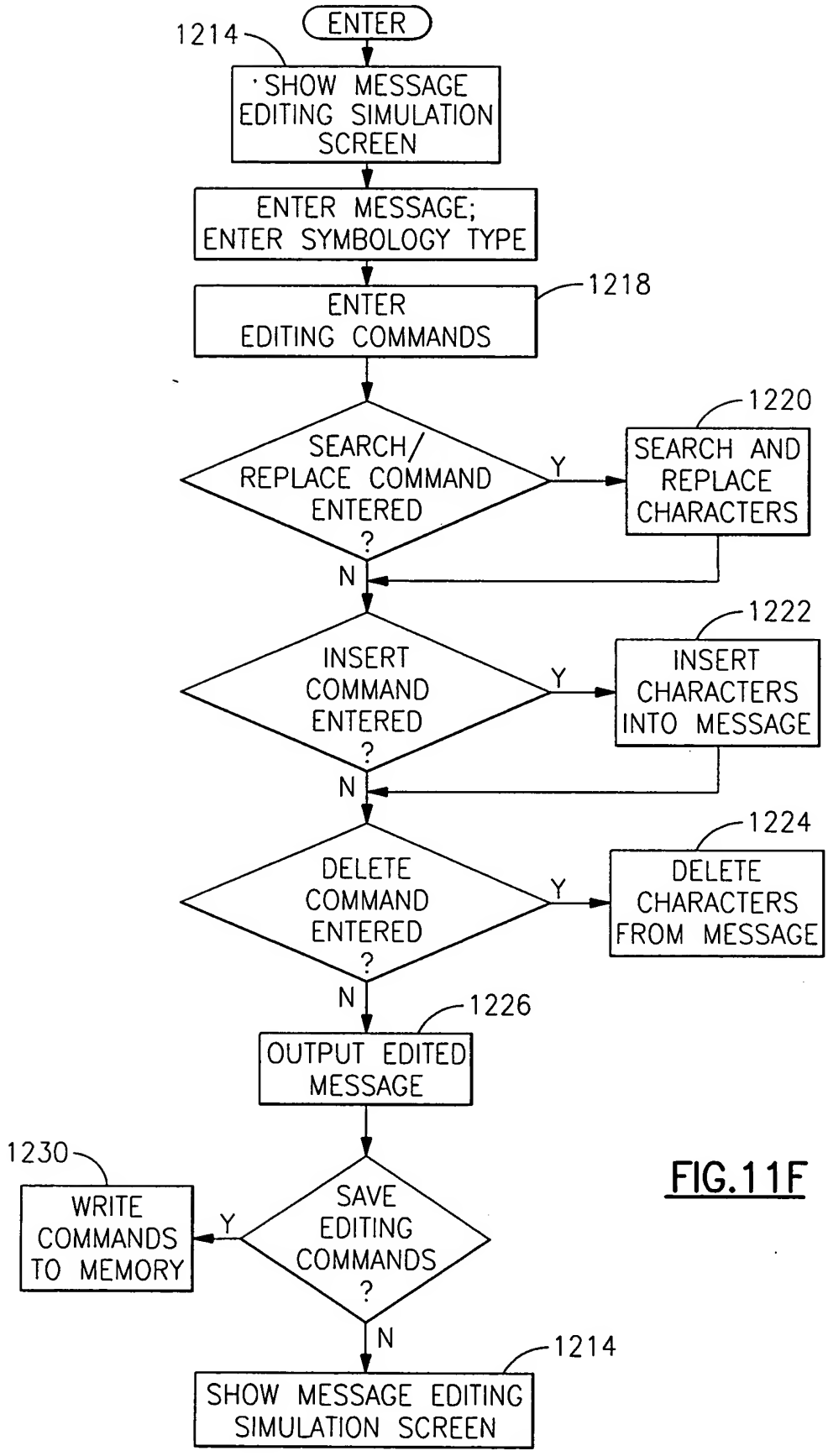

ENTER
1214
SHOW MESSAGE EDITING SIMULATION SCREEN
ENTER MESSAGE; ENTER SYMBOLOGY TYPE
ENTER EDITING COMMANDS
1218
SEARCH/ REPLACE COMMAND ENTERED ?
Y
1220
SEARCH AND REPLACE CHARACTERS
N
INSERT COMMAND ENTERED ?
Y
1222
INSERT CHARACTERS INTO MESSAGE
N
DELETE COMMAND ENTERED ?
Y
1224
DELETE CHARACTERS FROM MESSAGE
N
1226
OUTPUT EDITED MESSAGE
1230
WRITE COMMANDS TO MEMORY
Y
SAVE EDITING COMMANDS ?
N
1214
SHOW MESSAGE EDITING SIMULATION SCREEN

FIG.11F

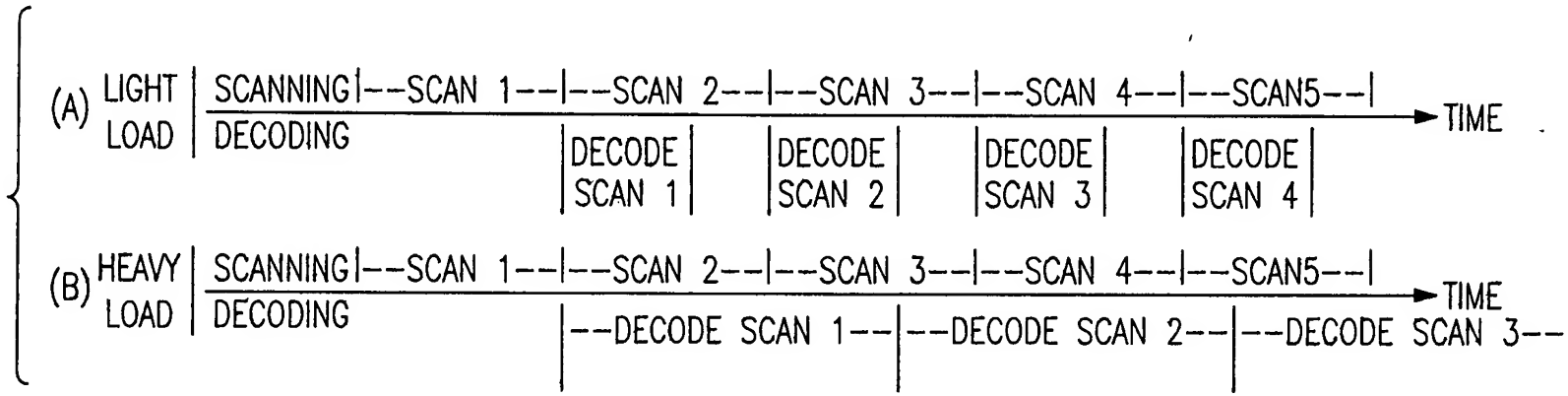


FIG.12
Prior Art

Express Mail Label No. EV317007417 US
Andrew Longacre, Jr. et al.
For: Optical Reader Having Solid-State Image Sensor
Our Docket No.: 703-006.50.24
Telephone: (315) 425-9000

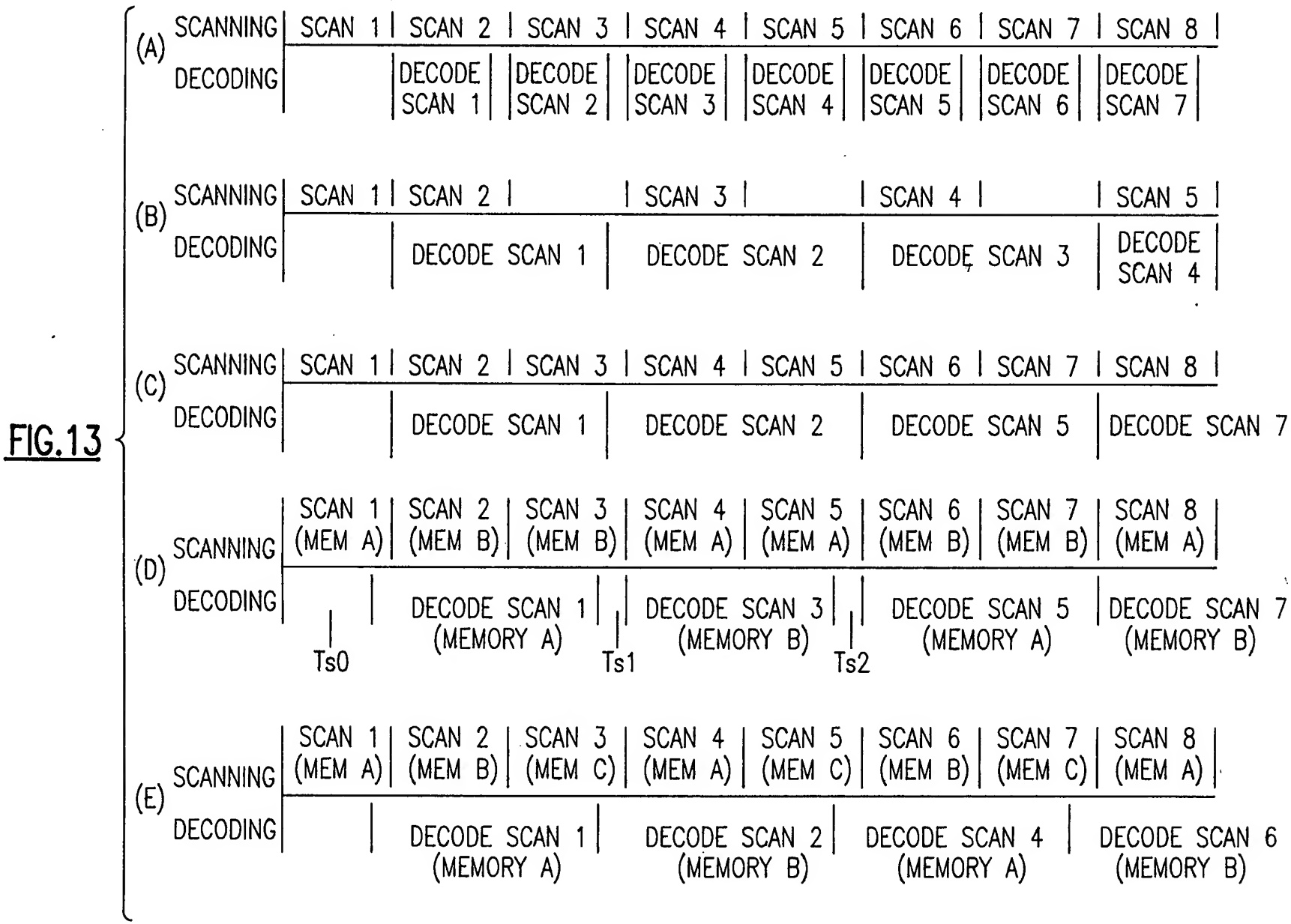
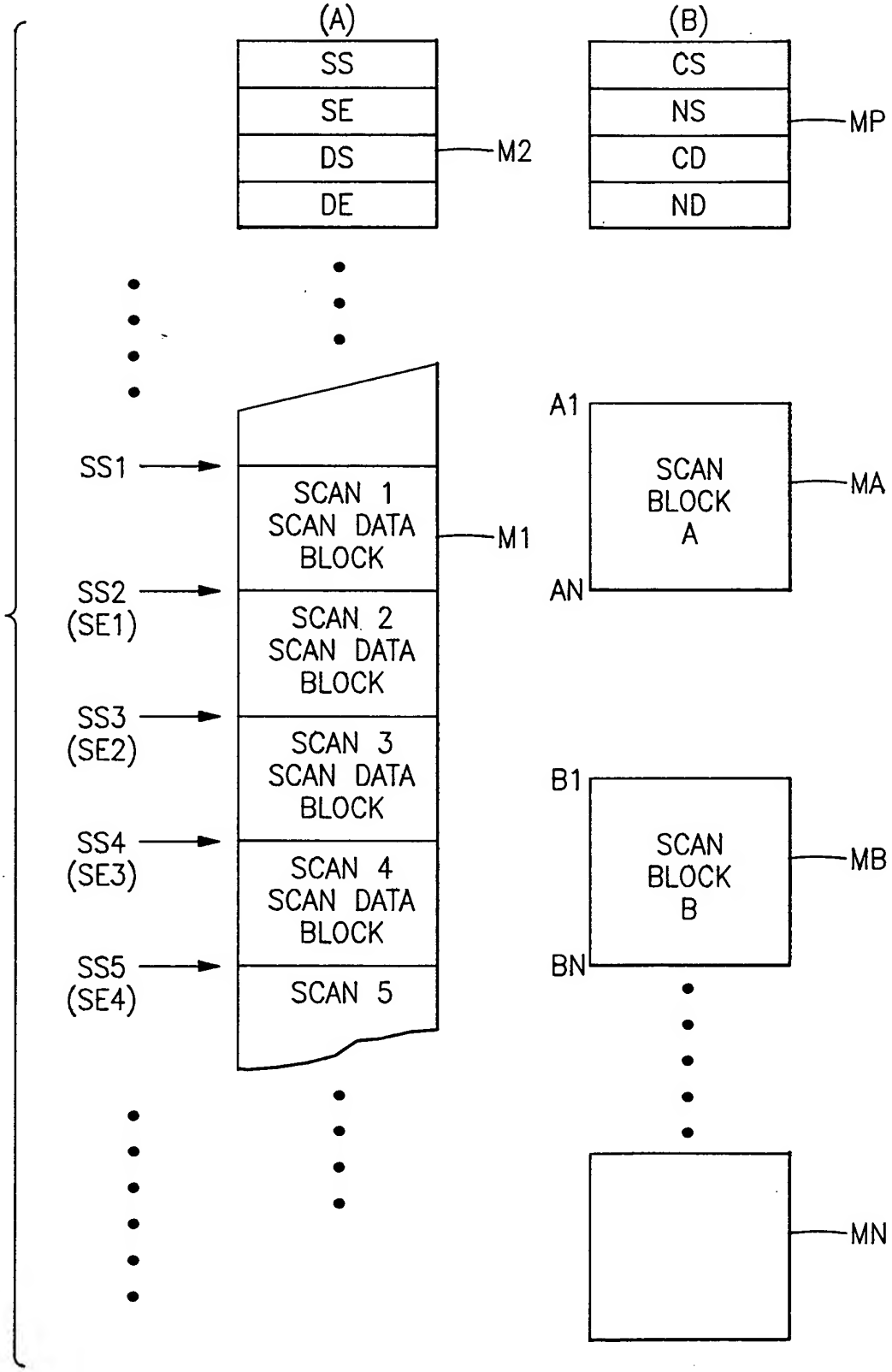


FIG.13

Express Mail Label No. EV317007417 US
Andrew Longacre, Jr. et al.
For: Optical Reader Having Solid-State Image Sensor
Our Docket No.: 703-006.50.24
Telephone: (315) 425-9000

FIG.14


(A)
SS
SE
DS
DE
M2
(B)
CS
NS
CD
ND
MP
SS1
SCAN 1 SCAN DATA BLOCK
M1
SS2 (SE1)
SCAN 2 SCAN DATA BLOCK
SS3 (SE2)
SCAN 3 SCAN DATA BLOCK
SS4 (SE3)
SCAN 4 SCAN DATA BLOCK
SS5 (SE4)
SCAN 5
A1
SCAN BLOCK A
AN
MA
B1
SCAN BLOCK B
BN
MB
MN

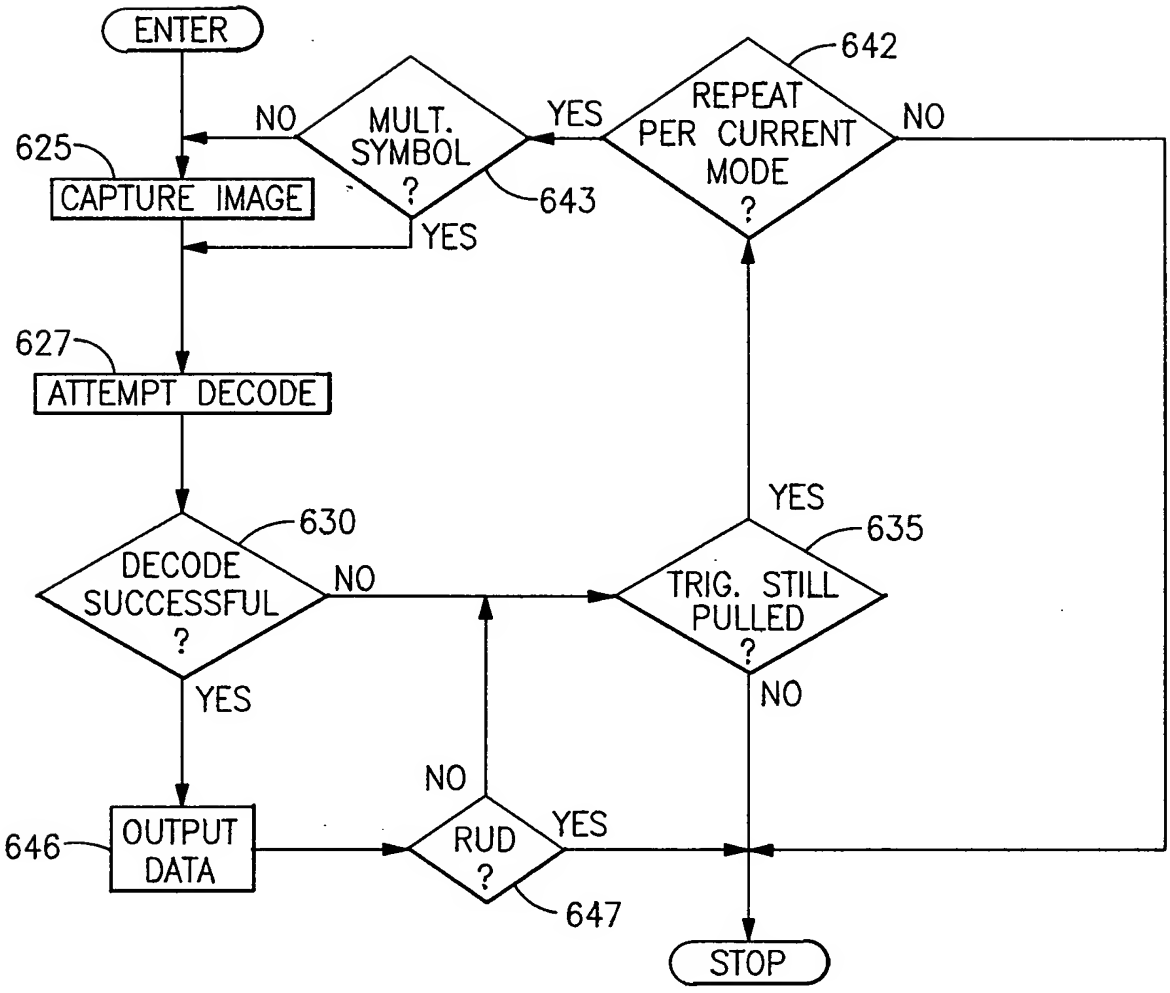

ENTER
625
CAPTURE IMAGE
627
ATTEMPT DECODE
630
DECODE SUCCESSFUL ?
NO
YES
646
OUTPUT DATA
NO
RUD ?
YES
647
MULT. SYMBOL ?
NO
YES
643
642
REPEAT PER CURRENT MODE ?
NO
YES
635
TRIG. STILL PULLED ?
NO
STOP

FIG.15

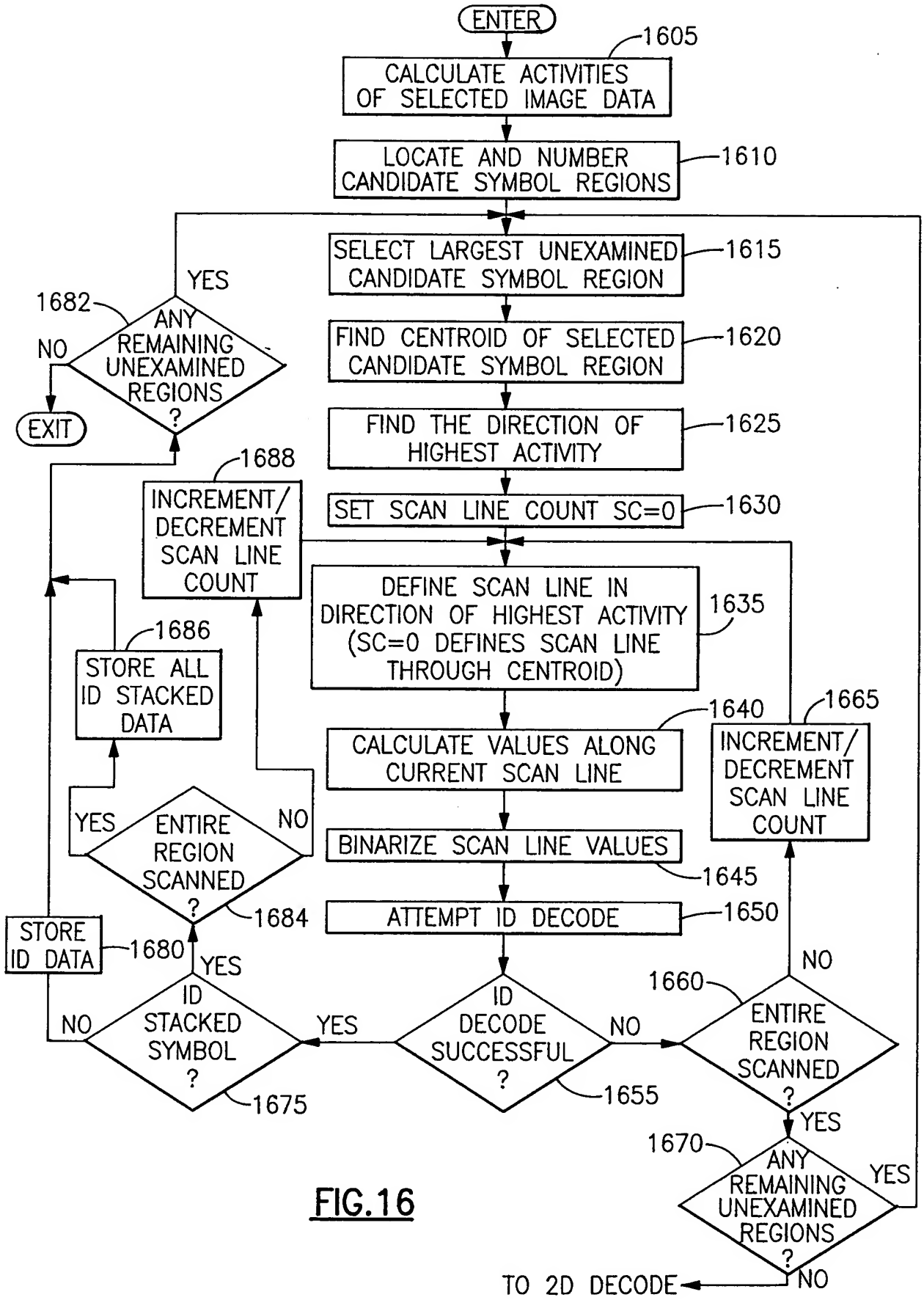

ENTER
1605
CALCULATE ACTIVITIES OF SELECTED IMAGE DATA
LOCATE AND NUMBER CANDIDATE SYMBOL REGIONS
1610
SELECT LARGEST UNEXAMINED CANDIDATE SYMBOL REGION
1615
FIND CENTROID OF SELECTED CANDIDATE SYMBOL REGION
1620
FIND THE DIRECTION OF HIGHEST ACTIVITY
1625
SET SCAN LINE COUNT SC=0
1630
DEFINE SCAN LINE IN DIRECTION OF HIGHEST ACTIVITY (SC=0 DEFINES SCAN LINE THROUGH CENTROID)
1635
CALCULATE VALUES ALONG CURRENT SCAN LINE
1640
BINARIZE SCAN LINE VALUES
1645
ATTEMPT ID DECODE
1650
ID DECODE SUCCESSFUL ?
1655
YES
NO
ENTIRE REGION SCANNED ?
1660
NO
YES
INCREMENT/ DECREMENT SCAN LINE COUNT
1665
ANY REMAINING UNEXAMINED REGIONS ?
1670
YES
NO
TO 2D DECODE
ID STACKED SYMBOL ?
1675
YES
NO
STORE ID DATA
1680
ENTIRE REGION SCANNED ?
1684
YES
NO
STORE ALL ID STACKED DATA
1686
INCREMENT/ DECREMENT SCAN LINE COUNT
1688
ANY REMAINING UNEXAMINED REGIONS ?
1682
YES
NO
EXIT

FIG.16

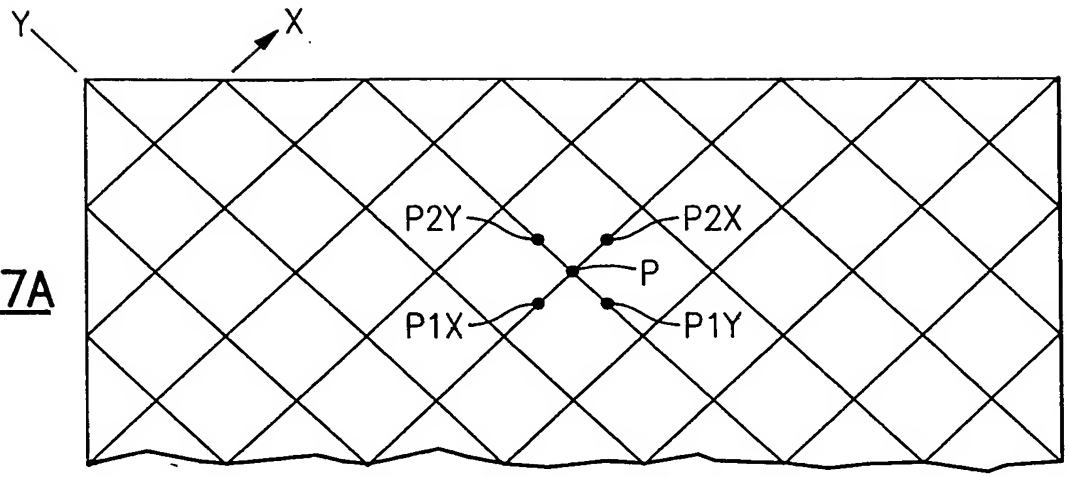


FIG.17A

$$A_P = (P2X-P1X)^2 + (P2Y-P1Y)^2$$

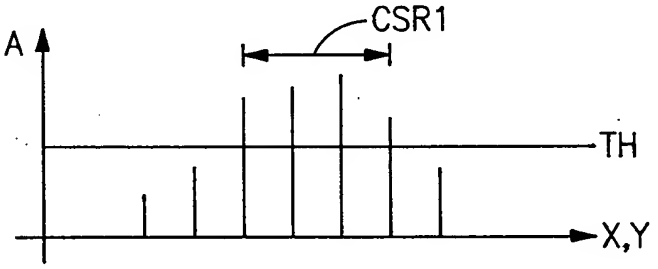


FIG.17B

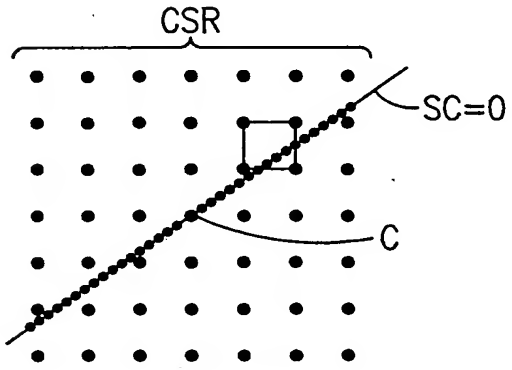


FIG.17C

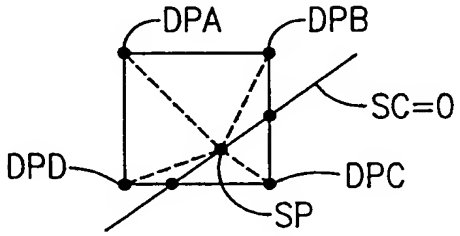


FIG.17D

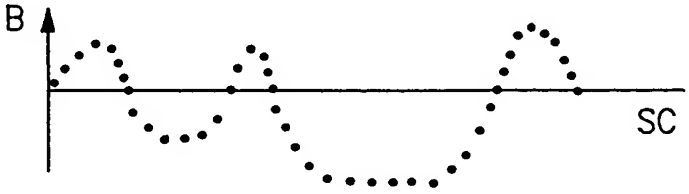


FIG.17E

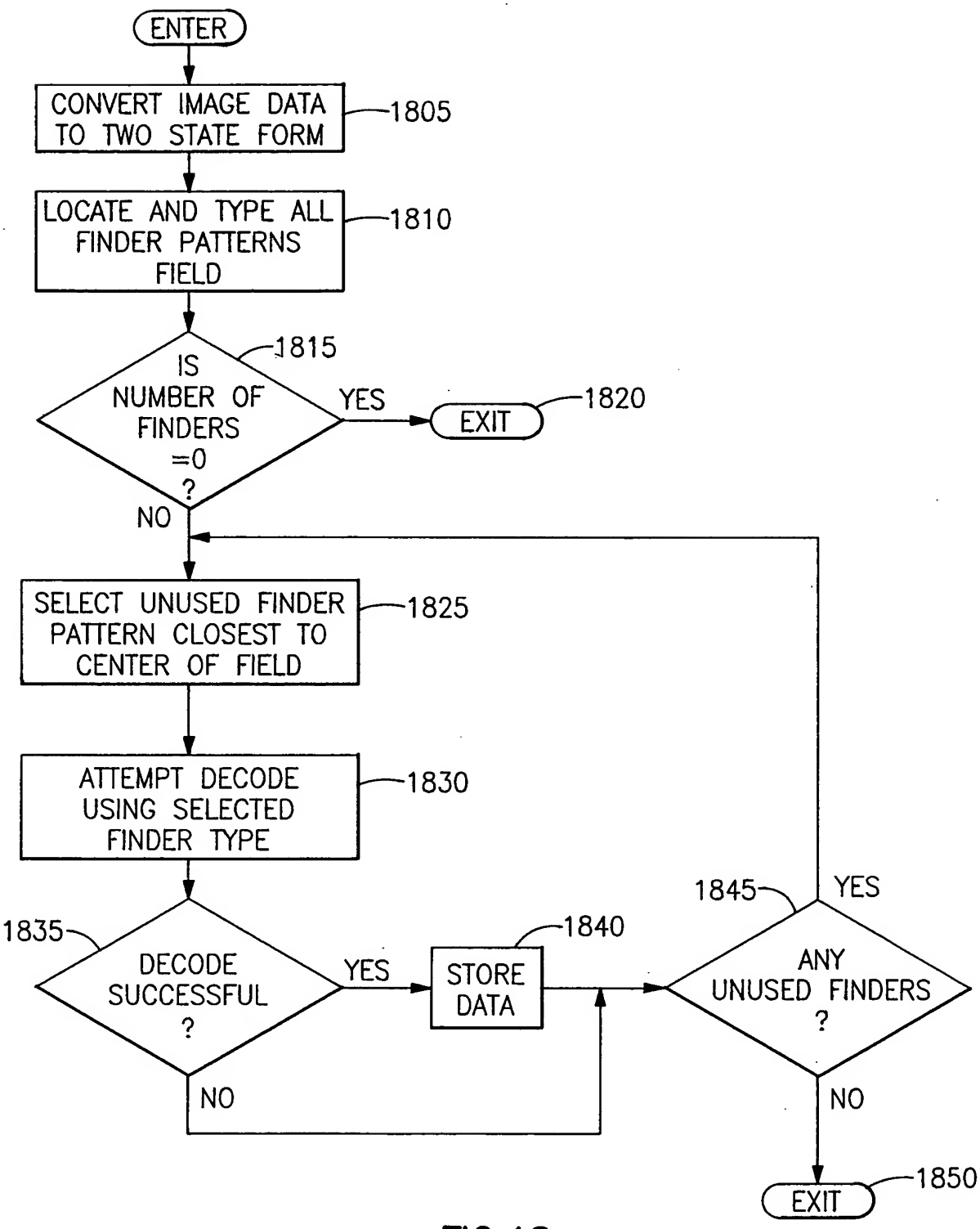

ENTER
CONVERT IMAGE DATA TO TWO STATE FORM
1805
LOCATE AND TYPE ALL FINDER PATTERNS FIELD
1810
IS NUMBER OF FINDERS =0 ?
1815
YES
EXIT
1820
NO
SELECT UNUSED FINDER PATTERN CLOSEST TO CENTER OF FIELD
1825
ATTEMPT DECODE USING SELECTED FINDER TYPE
1830
1835
DECODE SUCCESSFUL ?
YES
STORE DATA
1840
1845
ANY UNUSED FINDERS ?
YES
NO
NO
EXIT
1850

FIG.18

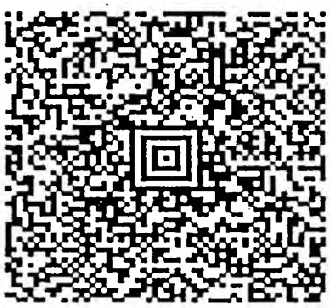


FIG.19A

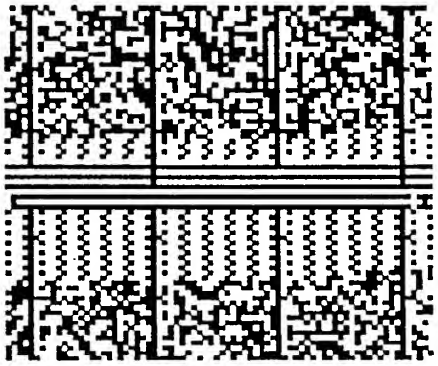


FIG.19B

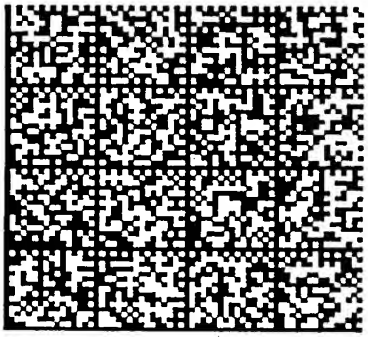


FIG.19C

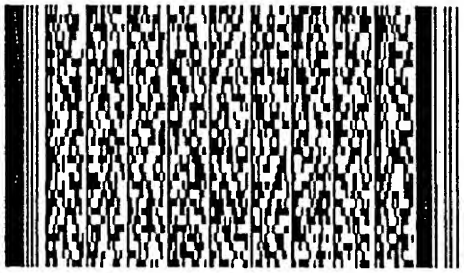


FIG.19D

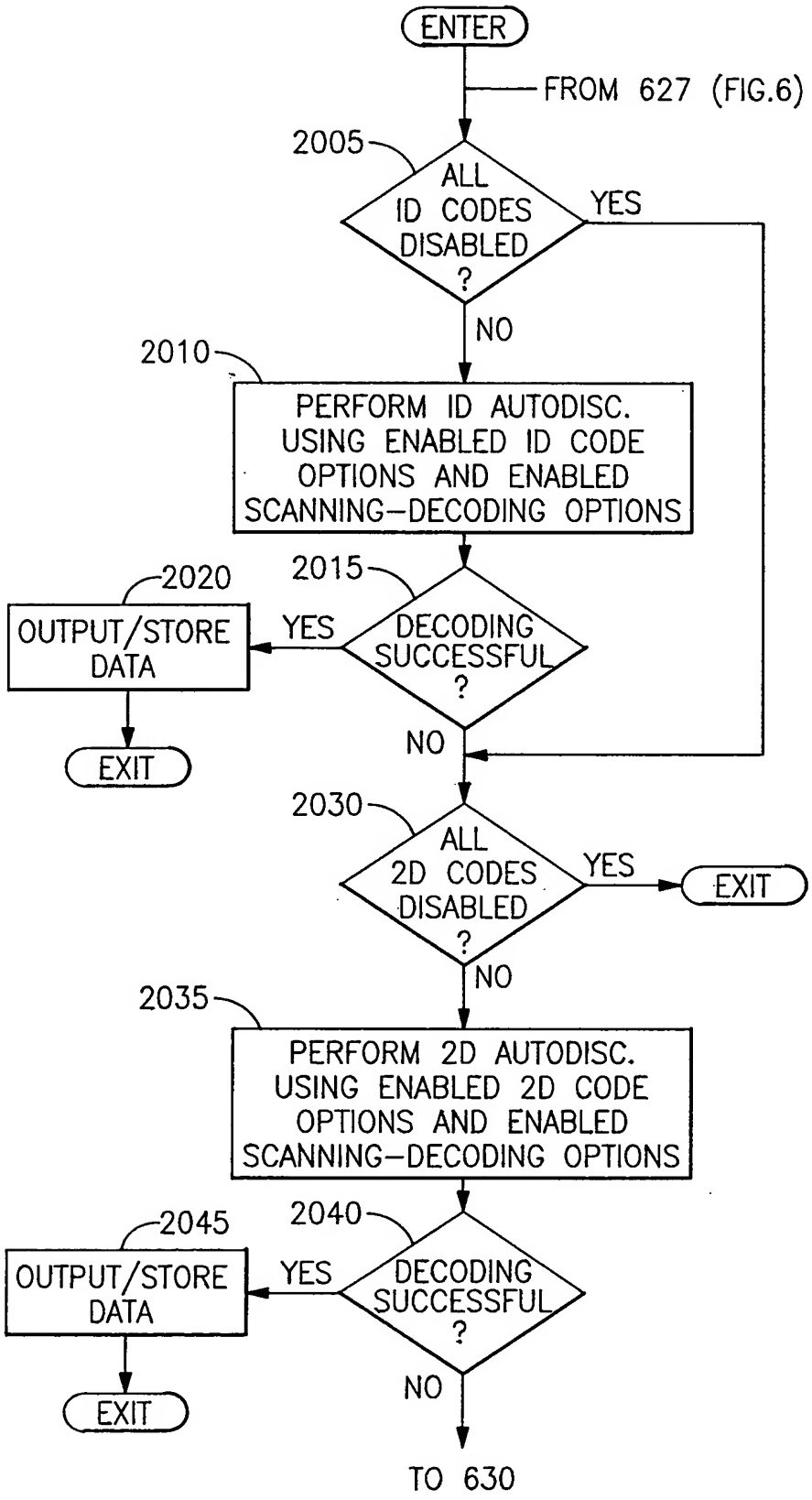

ENTER
FROM 627 (FIG.6)
2005
ALL ID CODES DISABLED ?
YES
NO
2010
PERFORM ID AUTODISC. USING ENABLED ID CODE OPTIONS AND ENABLED SCANNING–DECODING OPTIONS
2015
DECODING SUCCESSFUL ?
2020
YES
OUTPUT/STORE DATA
EXIT
NO
2030
ALL 2D CODES DISABLED ?
YES
EXIT
NO
2035
PERFORM 2D AUTODISC. USING ENABLED 2D CODE OPTIONS AND ENABLED SCANNING–DECODING OPTIONS
2040
DECODING SUCCESSFUL ?
2045
YES
OUTPUT/STORE DATA
EXIT
NO
TO 630

FIG.20

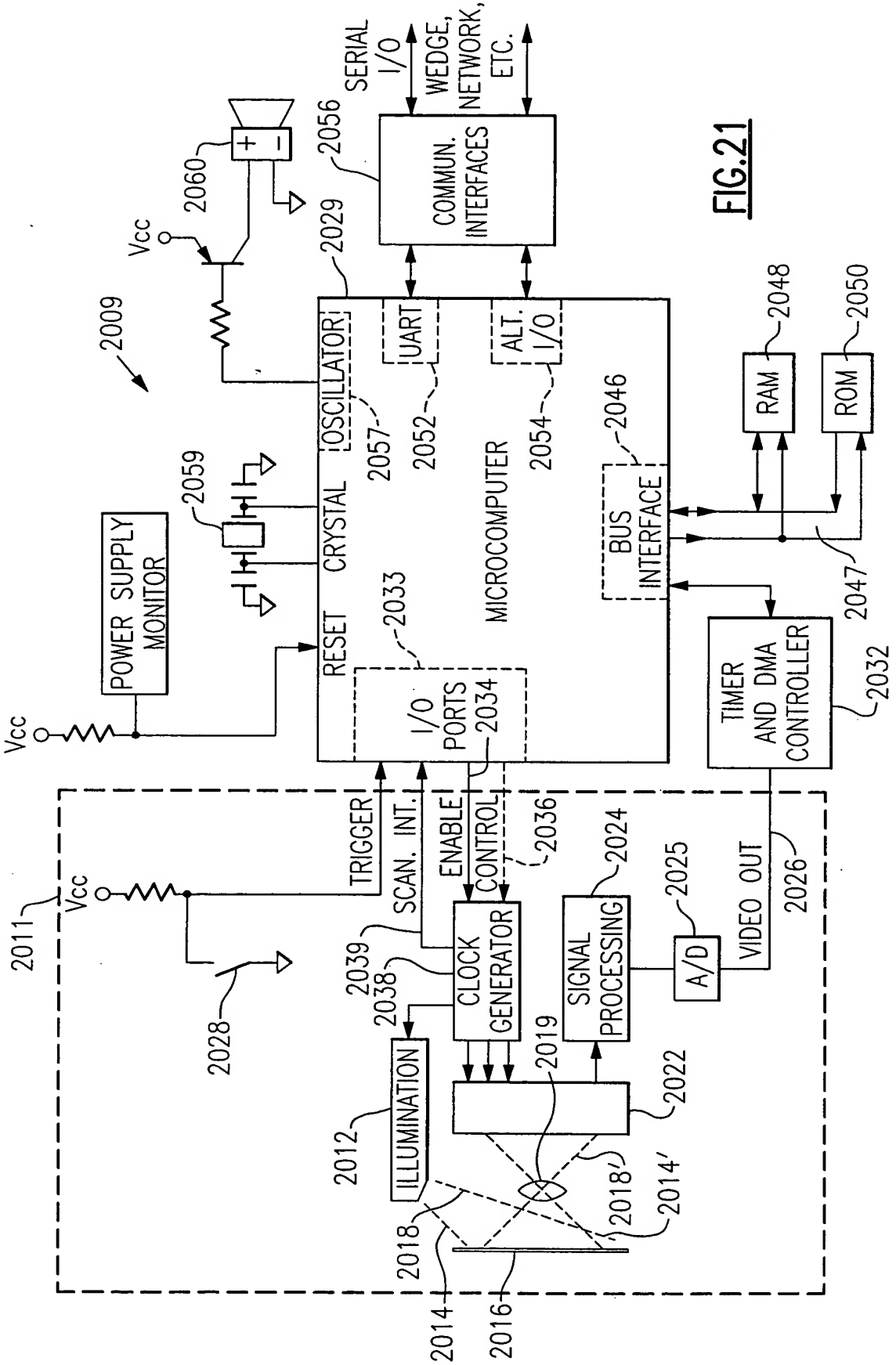

SERIAL I/O
WEDGE, NETWORK, ETC.
2056
COMMUN. INTERFACES
2060
Vcc
2029
2009
OSCILLATOR
UART
ALT. I/O
2057
2052
2054
2046
2048
RAM
2050
ROM
2059
CRYSTAL
MICROCOMPUTER
BUS INTERFACE
POWER SUPPLY MONITOR
RESET
2033
I/O PORTS
2034
2047
TIMER AND DMA CONTROLLER
2032
Vcc
TRIGGER
SCAN. INT.
ENABLE
CONTROL
2036
2024
2025
VIDEO OUT
2026
2011
Vcc
2039
CLOCK GENERATOR
SIGNAL PROCESSING
A/D
2038
2028
2019
2022
2012
ILLUMINATION
2018'
2014'
2018
2014
2016

FIG.21

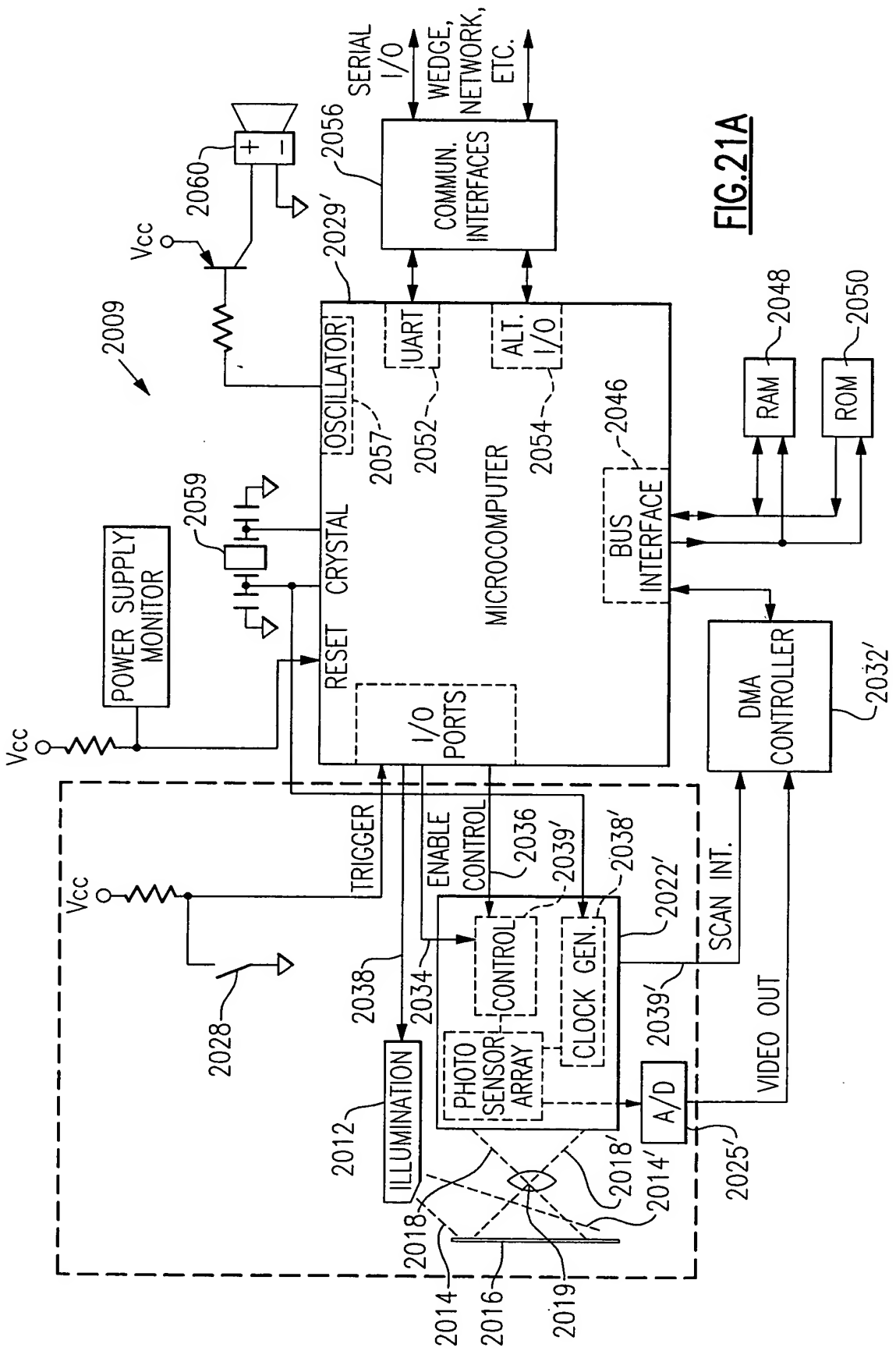

SERIAL I/O
WEDGE, NETWORK, ETC.
2056
COMMUN. INTERFACES
2060
Vcc
2029'
2009
OSCILLATOR
UART
ALT. I/O
2057
2052
2054
2046
2048
RAM
2050
ROM
2059
POWER SUPPLY MONITOR
CRYSTAL
MICROCOMPUTER
BUS INTERFACE
RESET
I/O PORTS
DMA CONTROLLER
2032'
TRIGGER
ENABLE CONTROL
2036
2039'
2038'
2022'
SCAN INT.
2028
2038
2034
CONTROL
CLOCK GEN.
2039'
VIDEO OUT
PHOTO SENSOR ARRAY
A/D
2012
ILLUMINATION
2018'
2014'
2025'
2018
2014
2016
2019

FIG.21A

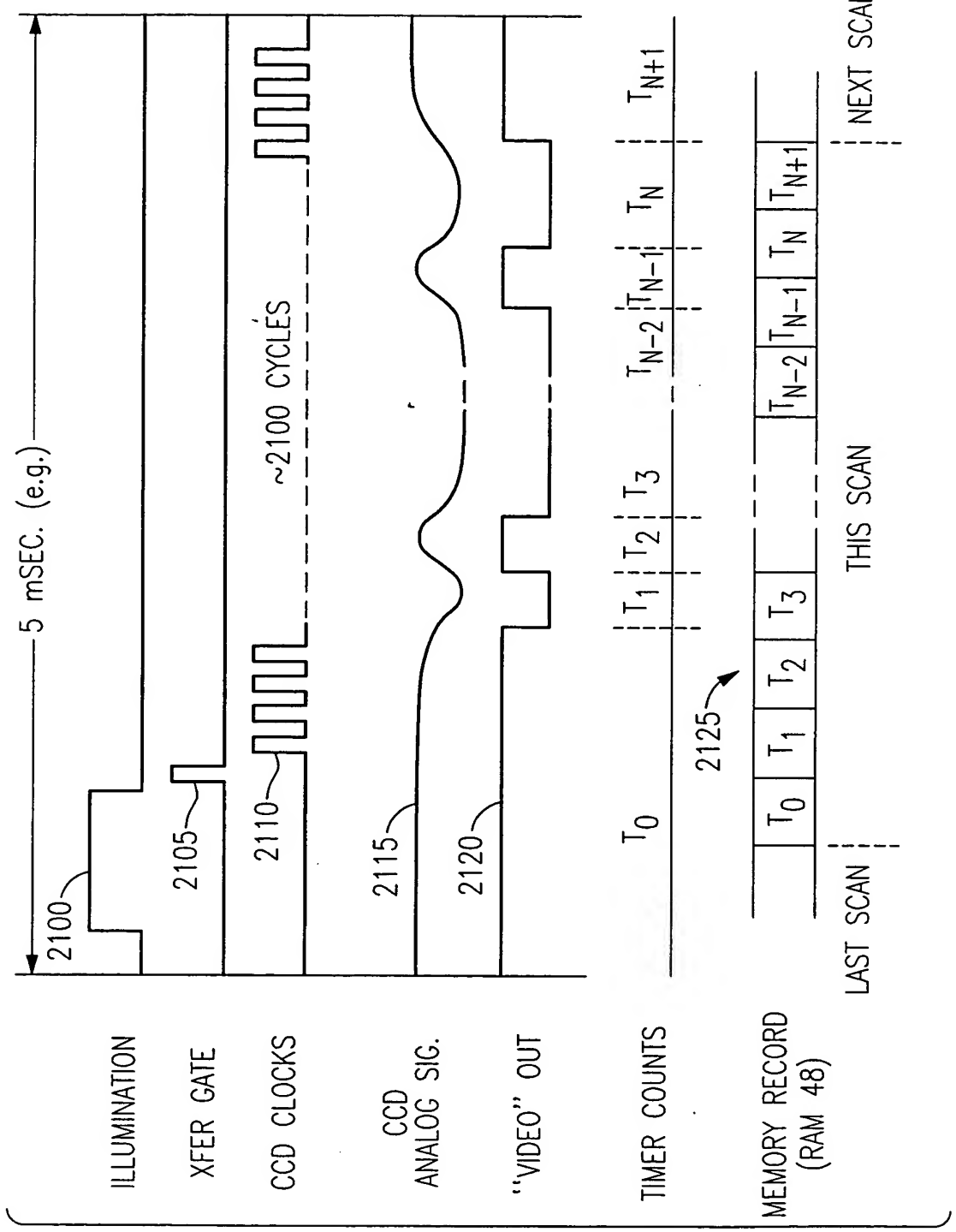

5 mSEC. (e.g.)
2100
2105
2110
~2100 CYCLES
2115
2120
ILLUMINATION
XFER GATE
CCD CLOCKS
CCD ANALOG SIG.
"VIDEO" OUT
TIMER COUNTS
MEMORY RECORD (RAM 48)
T_0
T_1
T_2
T_3
T_{N-2}
T_{N-1}
T_N
T_{N+1}
2125
LAST SCAN
THIS SCAN
NEXT SCAN

FIG.22

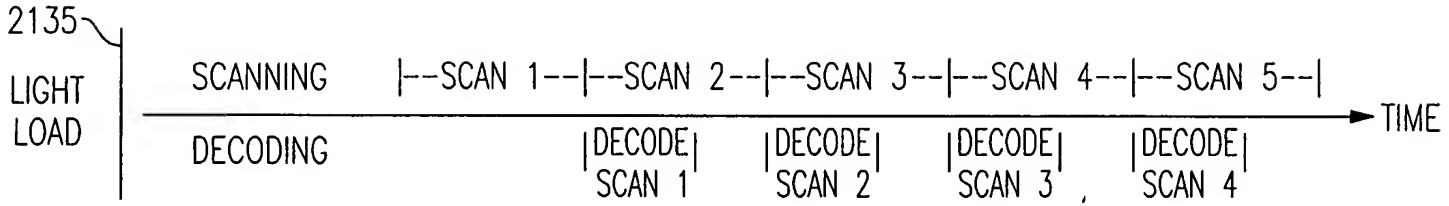


FIG.23A
Prior Art

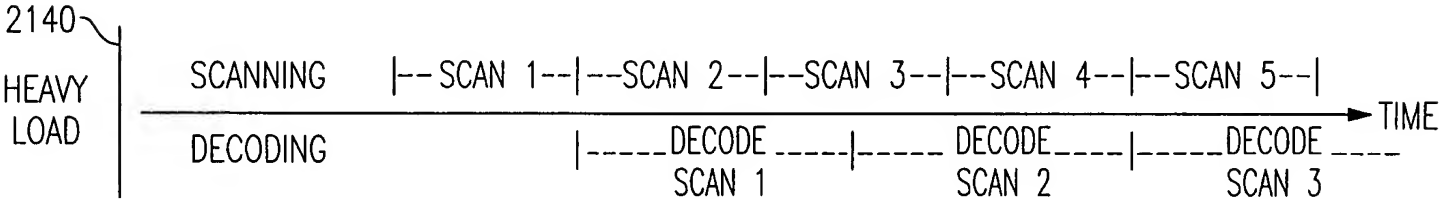


FIG.23B
Prior Art

Express Mail Label No. EV317007417 US
Andrew Longacre, Jr. et al.
For: Optical Reader Having Solid-State Image Sensor
Our Docket No.: 703-006.50.24
Telephone: (315) 425-9000

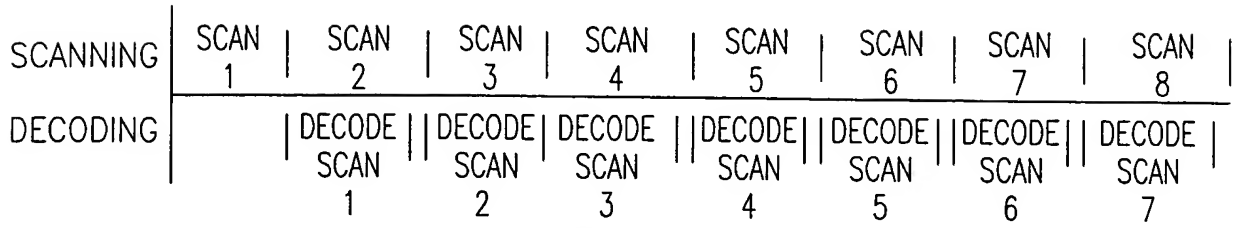


FIG.24A

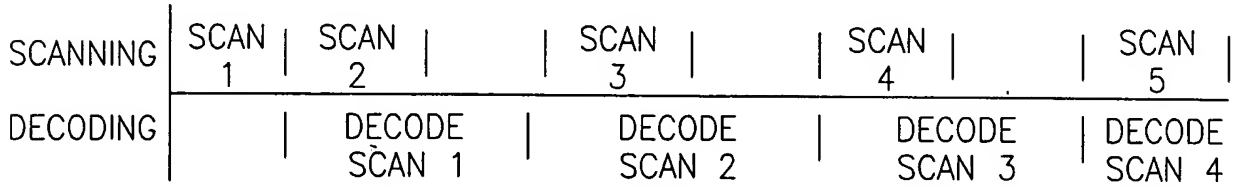


FIG.24B

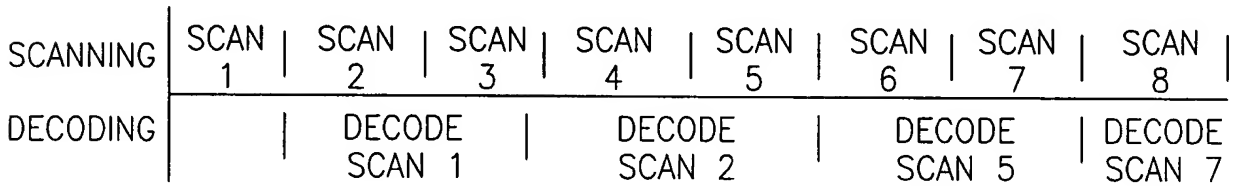


FIG.24C

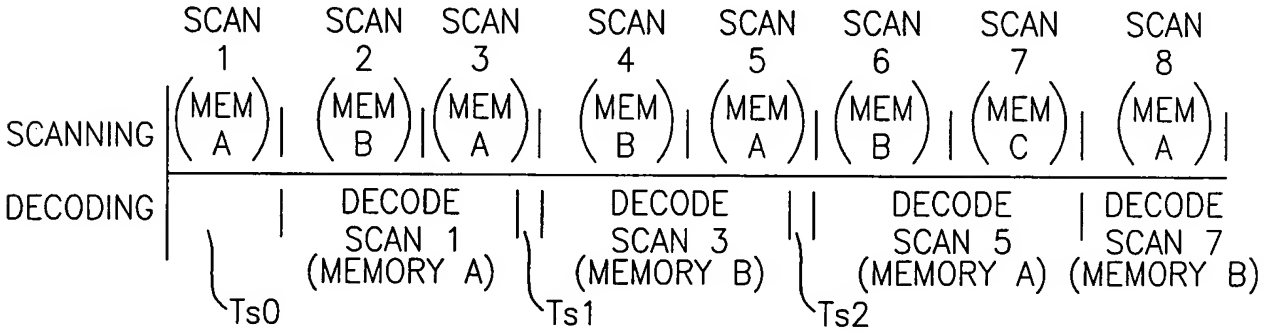


FIG.24D

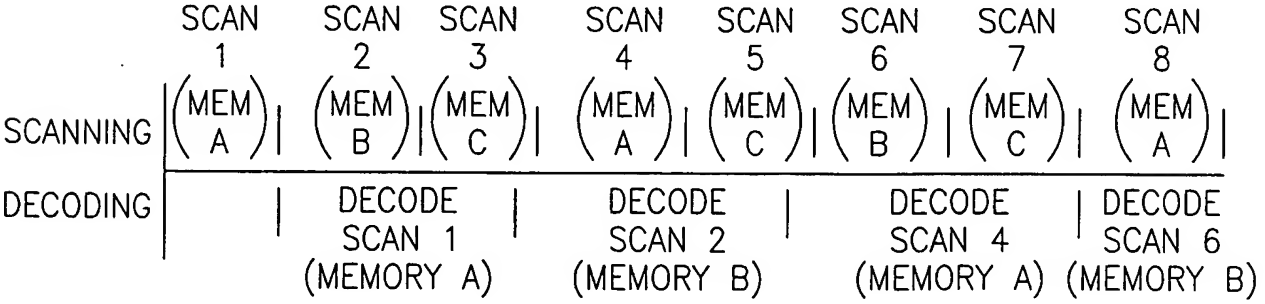


FIG.24E

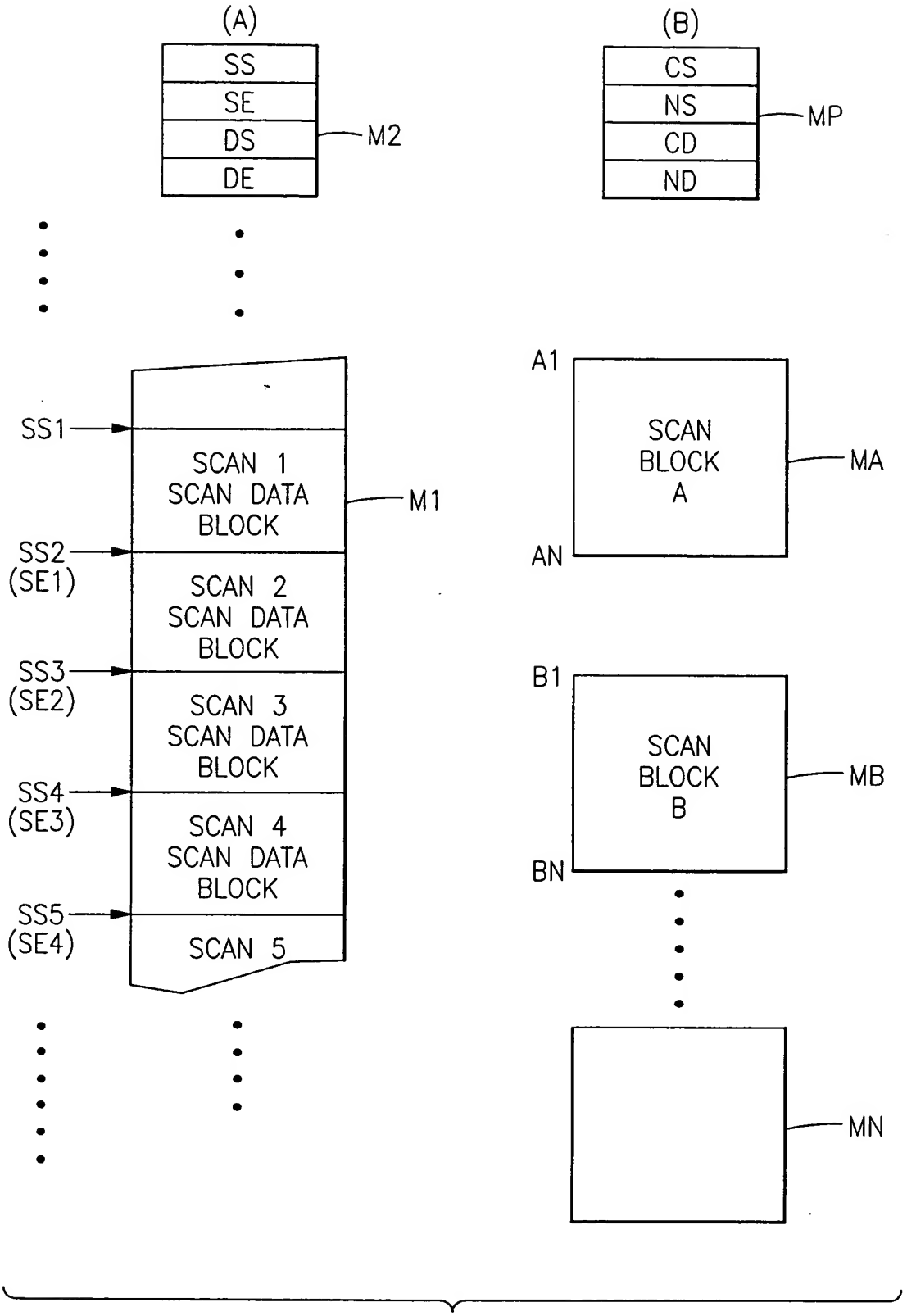

(A)
SS
SE
DS
DE
M2
(B)
CS
NS
CD
ND
MP
SS1
SCAN 1 SCAN DATA BLOCK
M1
SS2 (SE1)
SCAN 2 SCAN DATA BLOCK
SS3 (SE2)
SCAN 3 SCAN DATA BLOCK
SS4 (SE3)
SCAN 4 SCAN DATA BLOCK
SS5 (SE4)
SCAN 5
A1
SCAN BLOCK A
AN
MA
B1
SCAN BLOCK B
BN
MB
MN

FIG.25

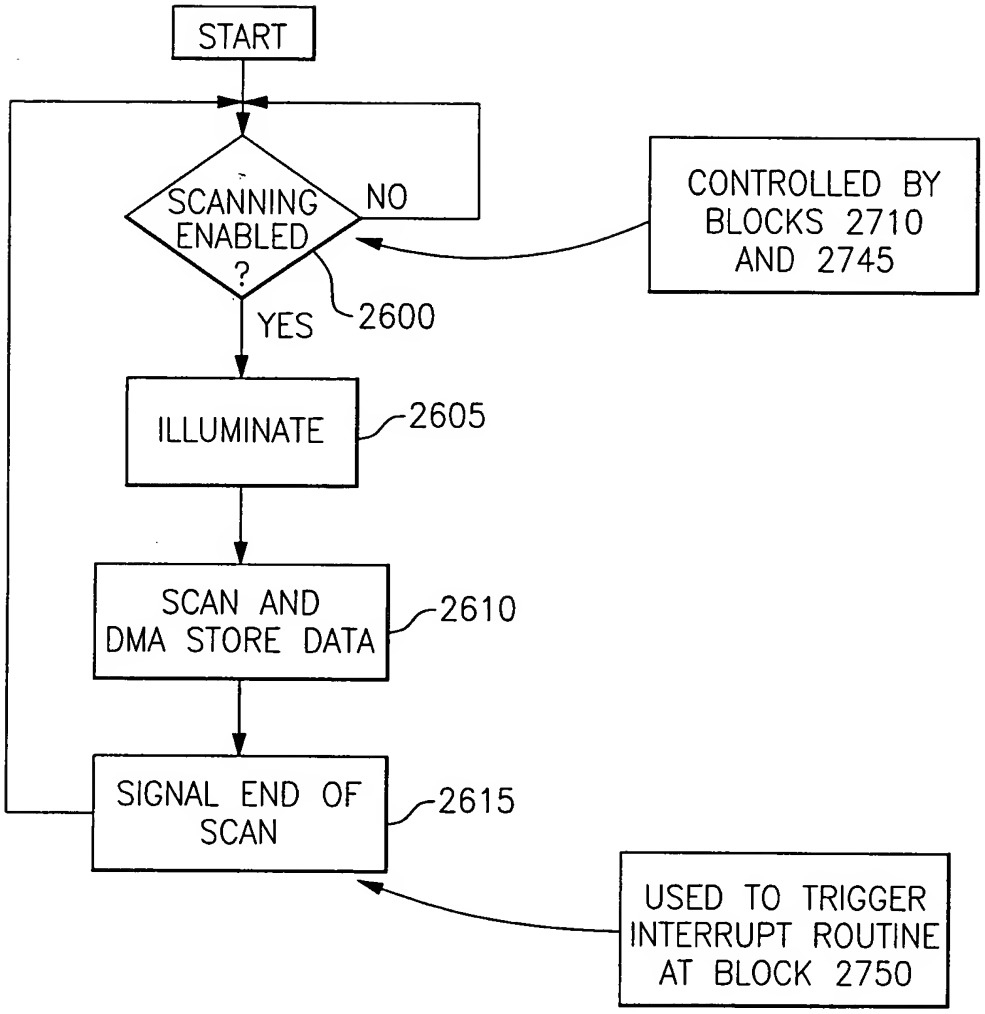

START
SCANNING ENABLED ?
NO
YES
2600
CONTROLLED BY BLOCKS 2710 AND 2745
ILLUMINATE
2605
SCAN AND DMA STORE DATA
2610
SIGNAL END OF SCAN
2615
USED TO TRIGGER INTERRUPT ROUTINE AT BLOCK 2750

FIG.26

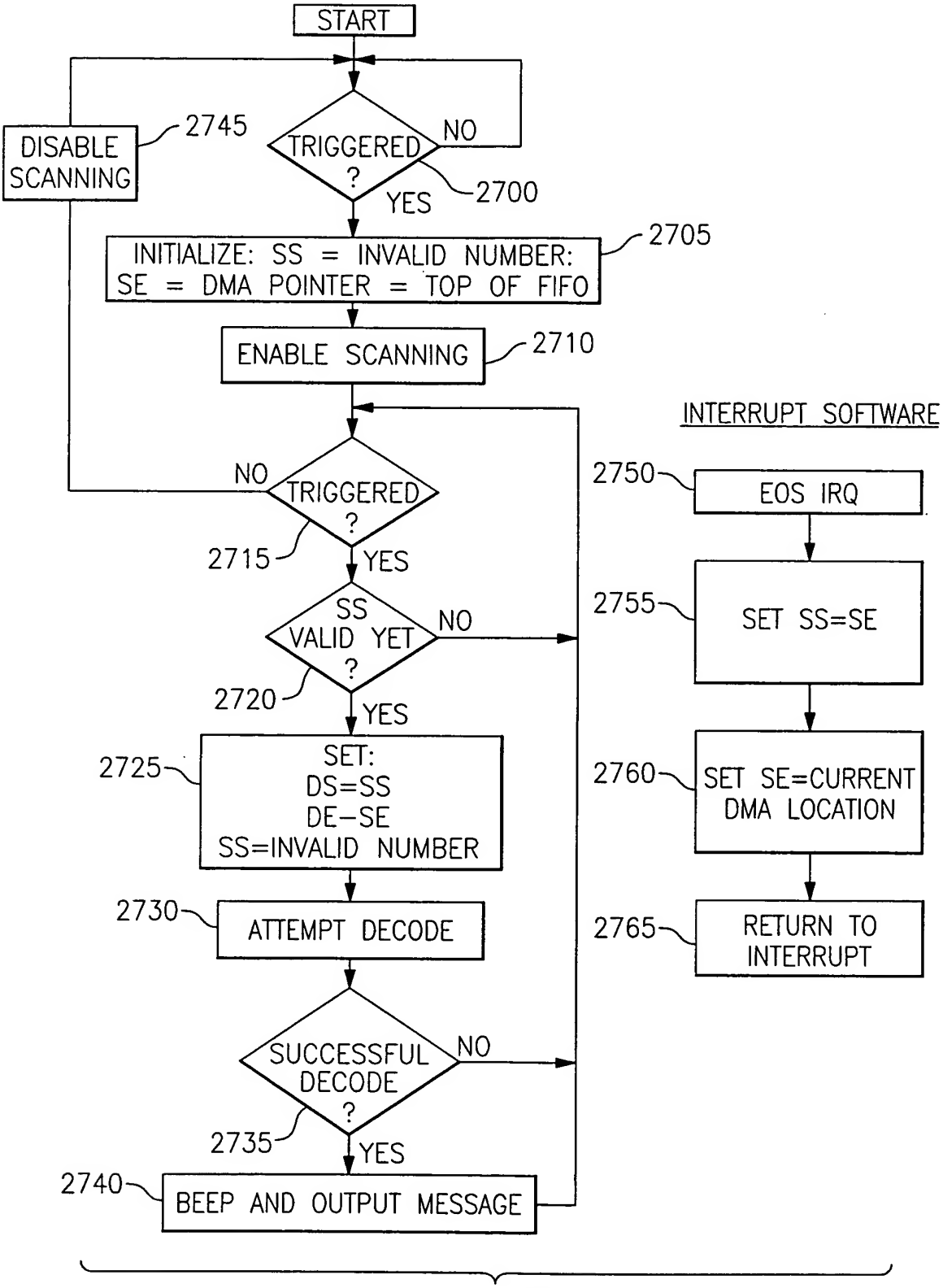

START
TRIGGERED ?
NO
YES
2700
DISABLE SCANNING
2745
INITIALIZE: SS = INVALID NUMBER: SE = DMA POINTER = TOP OF FIFO
2705
ENABLE SCANNING
2710
INTERRUPT SOFTWARE
NO
TRIGGERED ?
2715
YES
SS VALID YET ?
NO
2720
YES
SET: DS=SS DE-SE SS=INVALID NUMBER
2725
ATTEMPT DECODE
2730
SUCCESSFUL DECODE ?
NO
2735
YES
BEEP AND OUTPUT MESSAGE
2740
2750
EOS IRQ
2755
SET SS=SE
2760
SET SE=CURRENT DMA LOCATION
2765
RETURN TO INTERRUPT

FIG.27

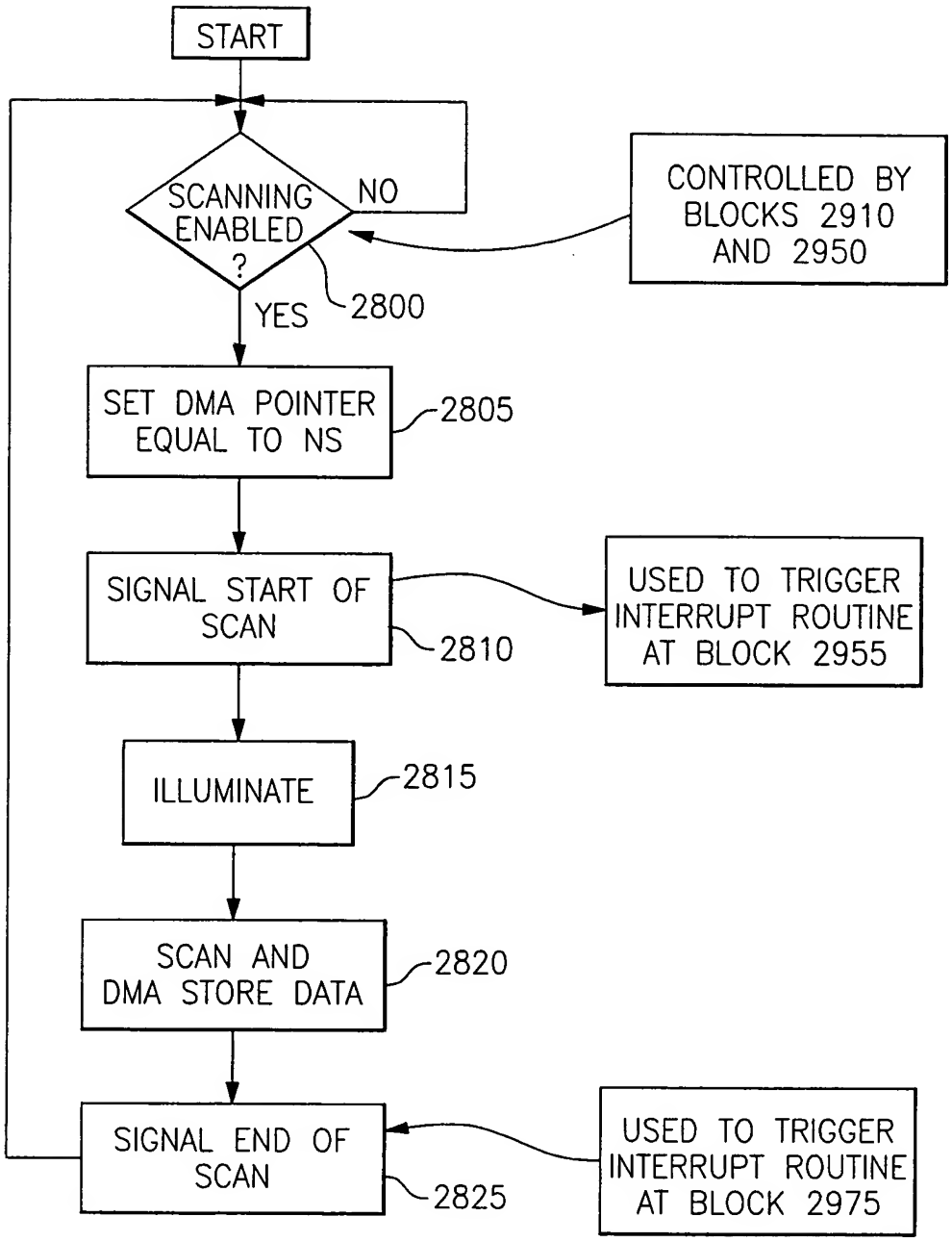

START
SCANNING ENABLED ?
NO
YES
2800
CONTROLLED BY BLOCKS 2910 AND 2950
SET DMA POINTER EQUAL TO NS
2805
SIGNAL START OF SCAN
2810
USED TO TRIGGER INTERRUPT ROUTINE AT BLOCK 2955
ILLUMINATE
2815
SCAN AND DMA STORE DATA
2820
SIGNAL END OF SCAN
2825
USED TO TRIGGER INTERRUPT ROUTINE AT BLOCK 2975

FIG.28

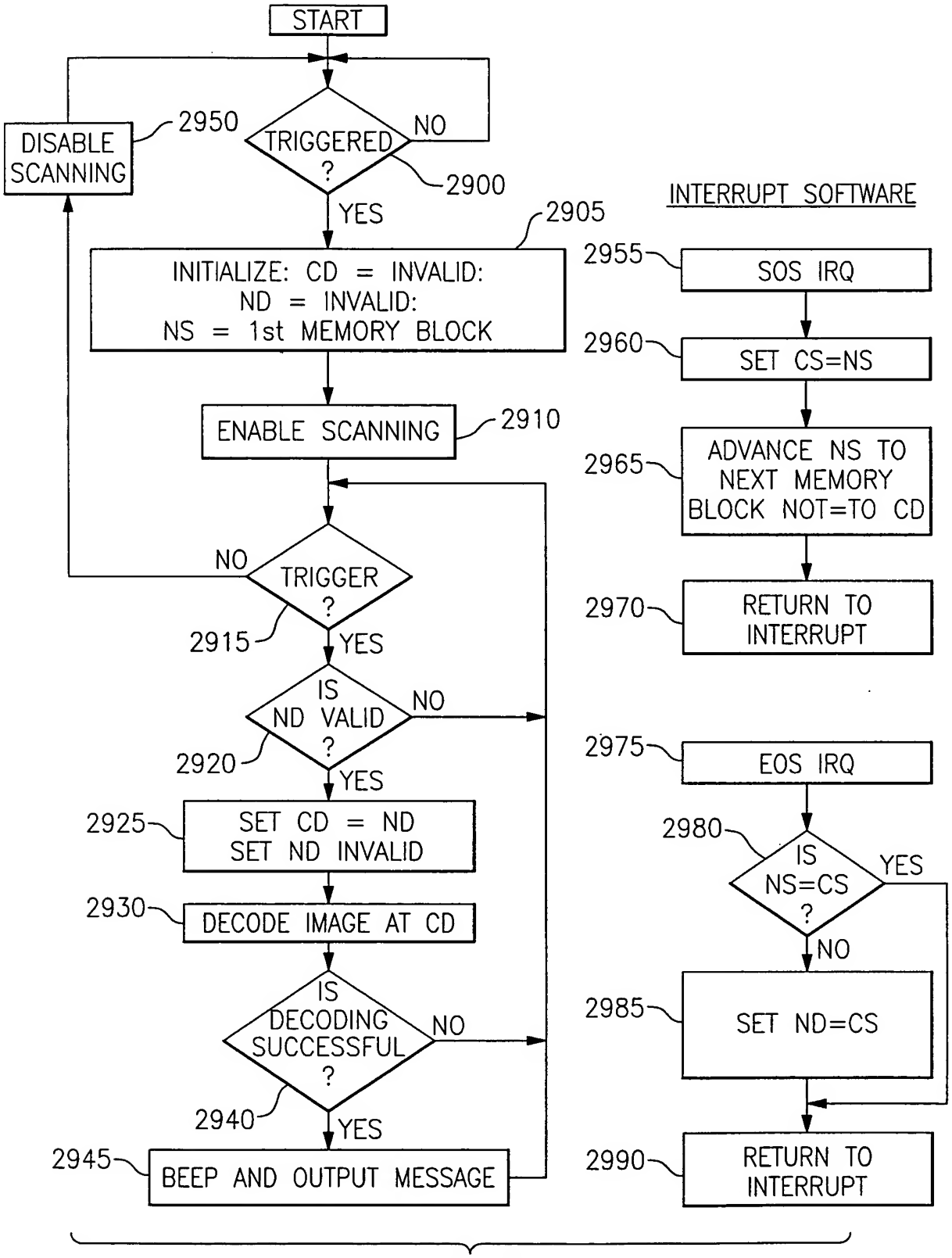

START
TRIGGERED ?
NO
YES
2900
DISABLE SCANNING
2950
INITIALIZE: CD = INVALID:
ND = INVALID:
NS = 1st MEMORY BLOCK
2905
ENABLE SCANNING
2910
TRIGGER ?
NO
2915
YES
IS ND VALID ?
NO
2920
YES
SET CD = ND
SET ND INVALID
2925
DECODE IMAGE AT CD
2930
IS DECODING SUCCESSFUL ?
NO
2940
YES
BEEP AND OUTPUT MESSAGE
2945
INTERRUPT SOFTWARE
SOS IRQ
2955
SET CS=NS
2960
ADVANCE NS TO NEXT MEMORY BLOCK NOT=TO CD
2965
RETURN TO INTERRUPT
2970
EOS IRQ
2975
IS NS=CS ?
2980
YES
NO
SET ND=CS
2985
RETURN TO INTERRUPT
2990

FIG.29

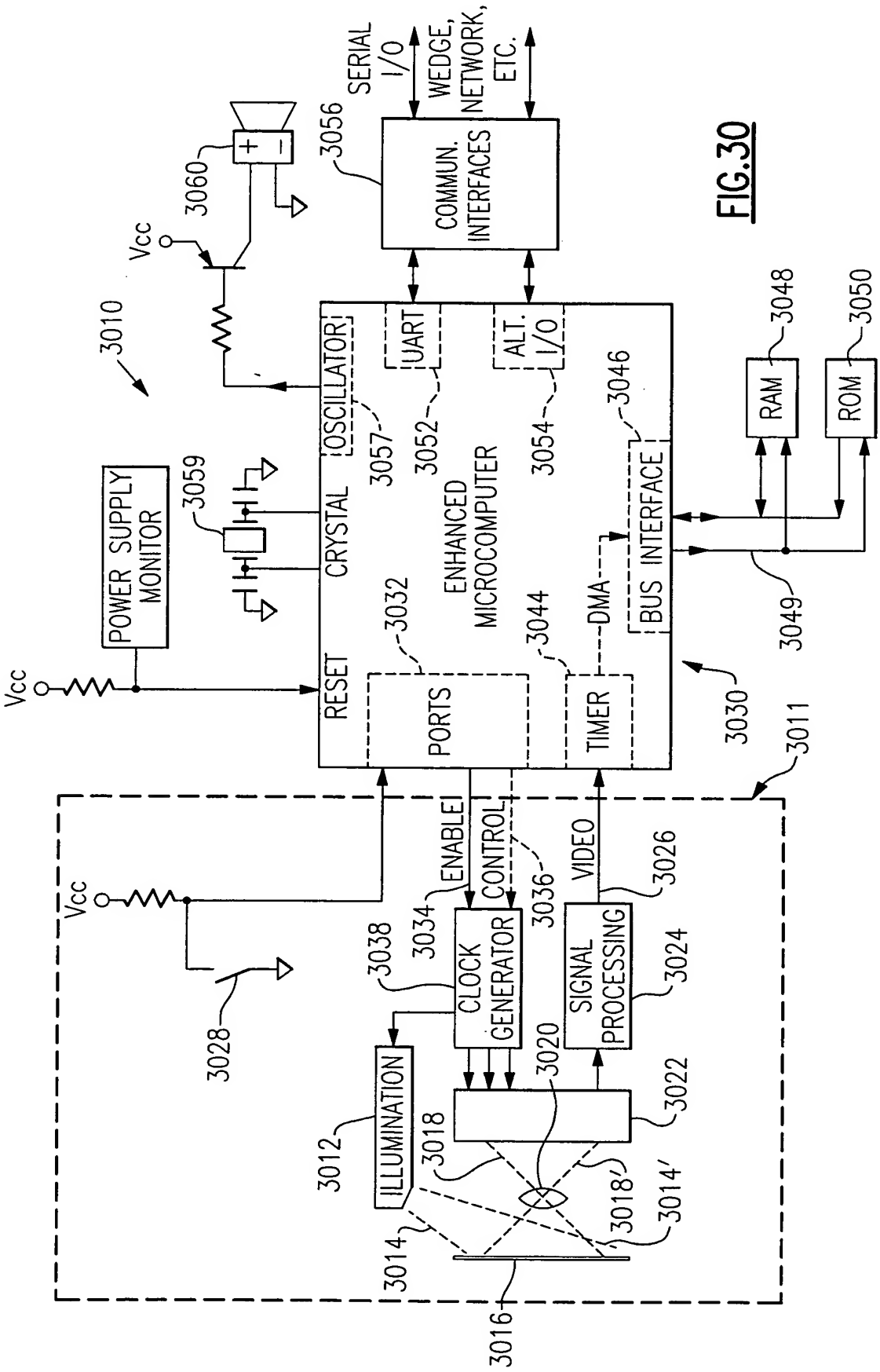

SERIAL I/O
WEDGE, NETWORK, ETC.
3056
COMMUN. INTERFACES
3060
Vcc
3010
OSCILLATOR
UART
ALT. I/O
3057
3052
3054
3046
3048
RAM
3050
ROM
POWER SUPPLY MONITOR
3059
CRYSTAL
ENHANCED MICROCOMPUTER
BUS INTERFACE
3049
Vcc
RESET
3032
PORTS
3044
DMA
TIMER
3030
3011
Vcc
ENABLE
CONTROL
VIDEO
3026
3036
3034
3038
CLOCK GENERATOR
SIGNAL PROCESSING
3024
3028
3020
3022
ILLUMINATION
3012
3018
3018'
3014'
3014
3016

FIG.30

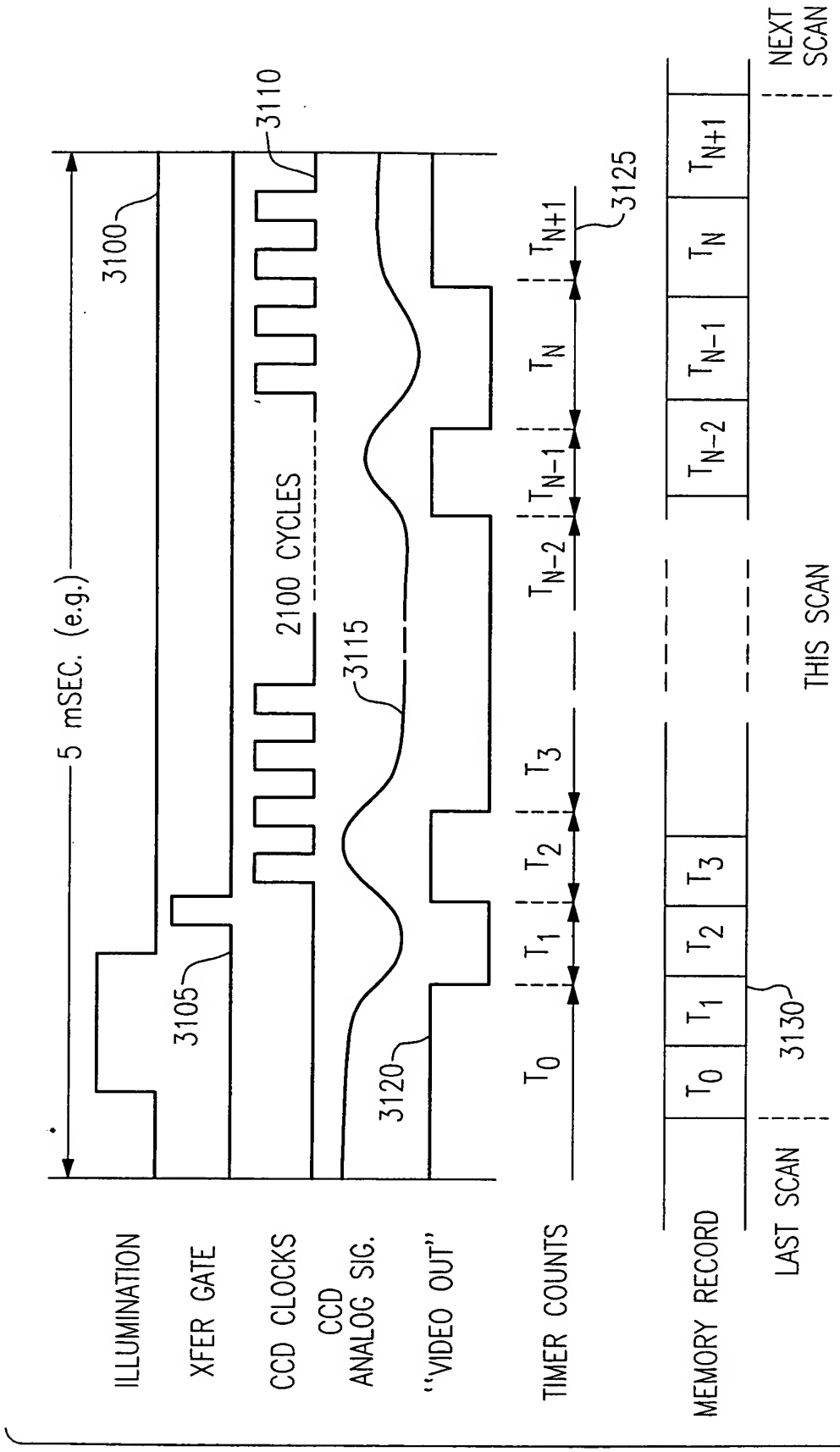

ILLUMINATION
XFER GATE
CCD CLOCKS
CCD ANALOG SIG.
"VIDEO OUT"
TIMER COUNTS
MEMORY RECORD
LAST SCAN
5 mSEC. (e.g.)
3100
3105
3110
2100 CYCLES
3115
3120
3125
3130
T_0
T_1
T_2
T_3
T_{N-2}
T_{N-1}
T_N
T_{N+1}
THIS SCAN
NEXT SCAN

FIG.31

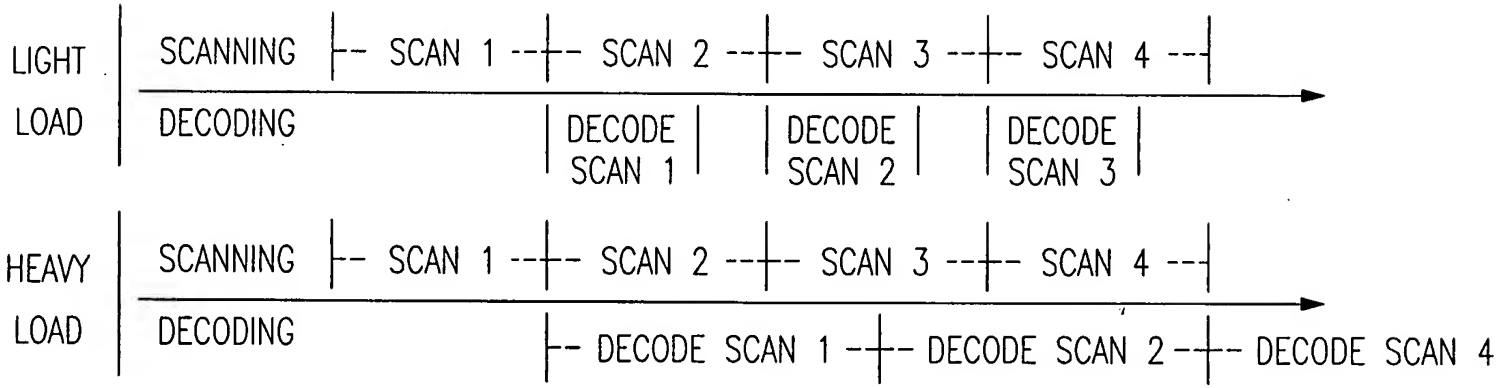


FIG.32A
Prior Art

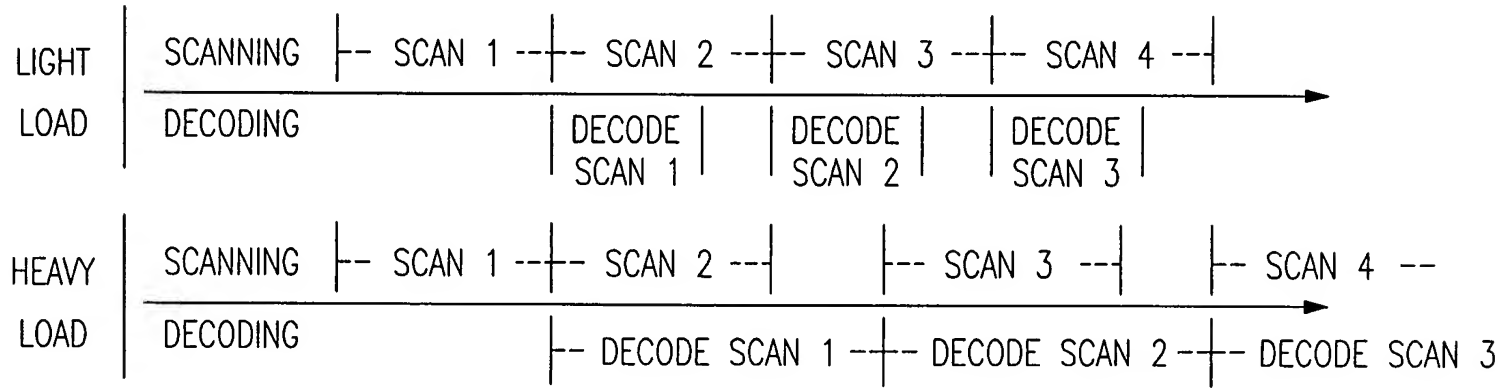


FIG.32B
Prior Art

Express Mail Label No. EV317007417 US
Andrew Longacre, Jr. et al.
For: Optical Reader Having Solid-State Image Sensor
Our Docket No.: 703-006.50.24
Telephone: (315) 425-9000

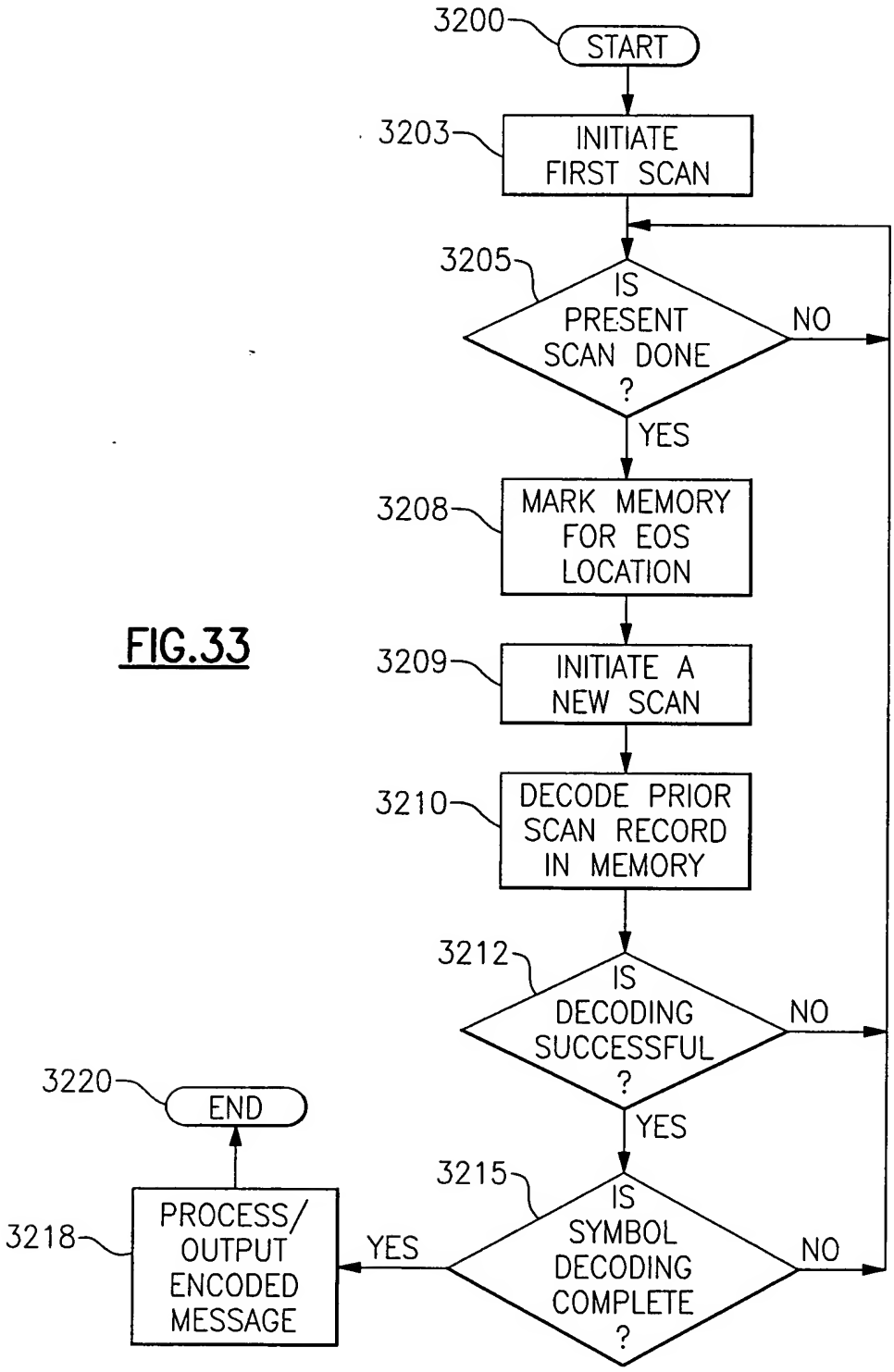

3200
START
3203
INITIATE FIRST SCAN
3205
IS PRESENT SCAN DONE ?
NO
YES
3208
MARK MEMORY FOR EOS LOCATION
3209
INITIATE A NEW SCAN
3210
DECODE PRIOR SCAN RECORD IN MEMORY
3212
IS DECODING SUCCESSFUL ?
NO
YES
3215
IS SYMBOL DECODING COMPLETE ?
NO
YES
3218
PROCESS/ OUTPUT ENCODED MESSAGE
3220
END

FIG.33

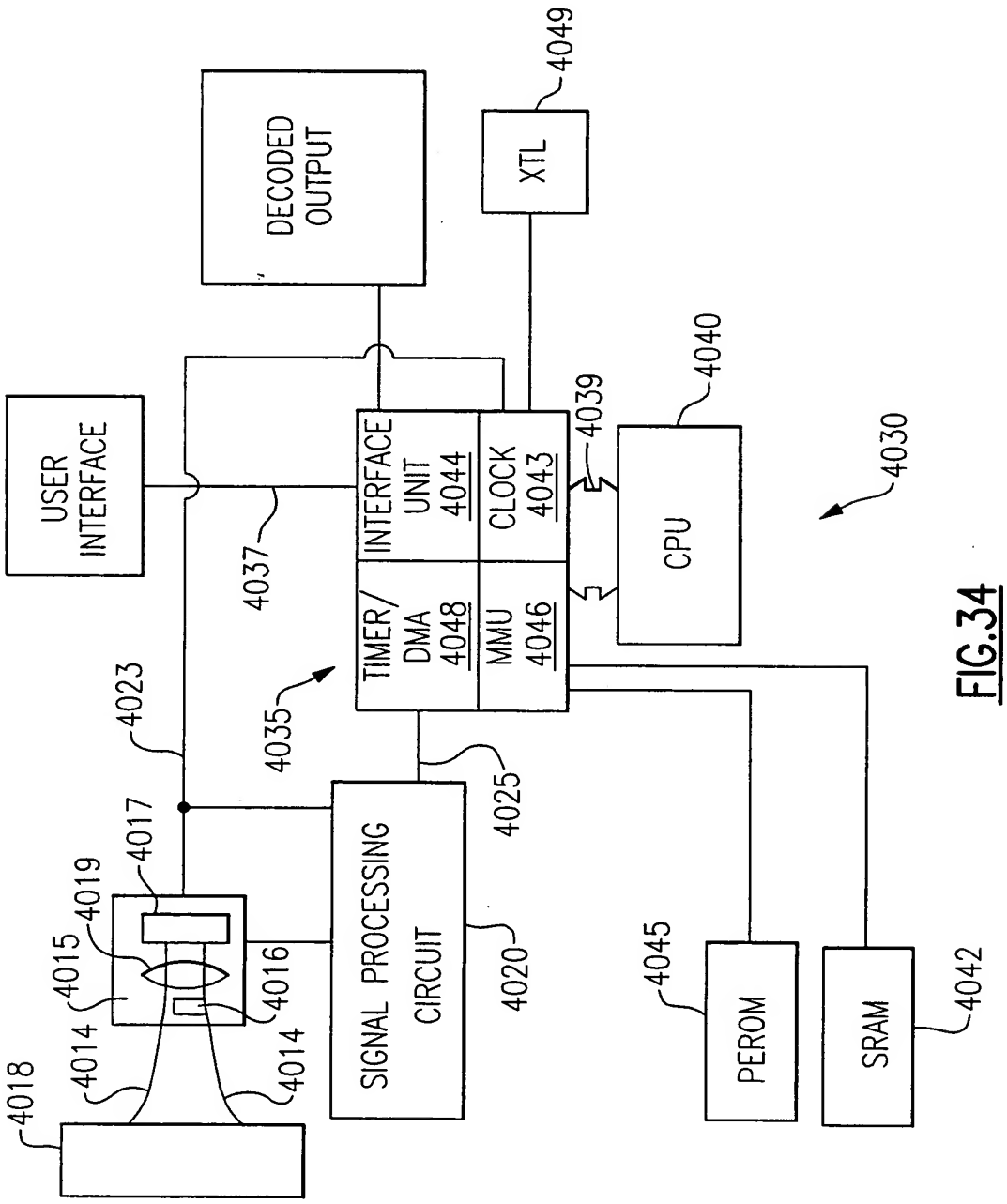

DECODED OUTPUT
4049
XTL
USER INTERFACE
INTERFACE UNIT 4044
CLOCK 4043
4039
4040
CPU
4030
4037
TIMER/ DMA 4048
MMU 4046
4023
4035
4025
4017
4019
4015
4016
4014
4014
SIGNAL PROCESSING CIRCUIT
4020
4045
PEROM
SRAM
4042
4018

FIG.34

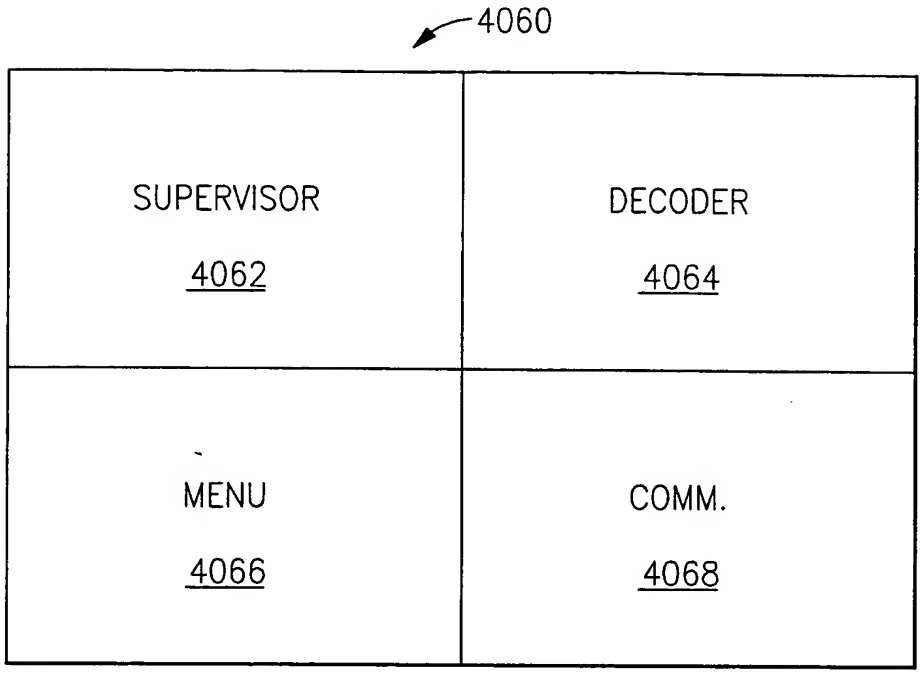

4060
SUPERVISOR
4062
DECODER
4064
MENU
4066
COMM.
4068

FIG.35

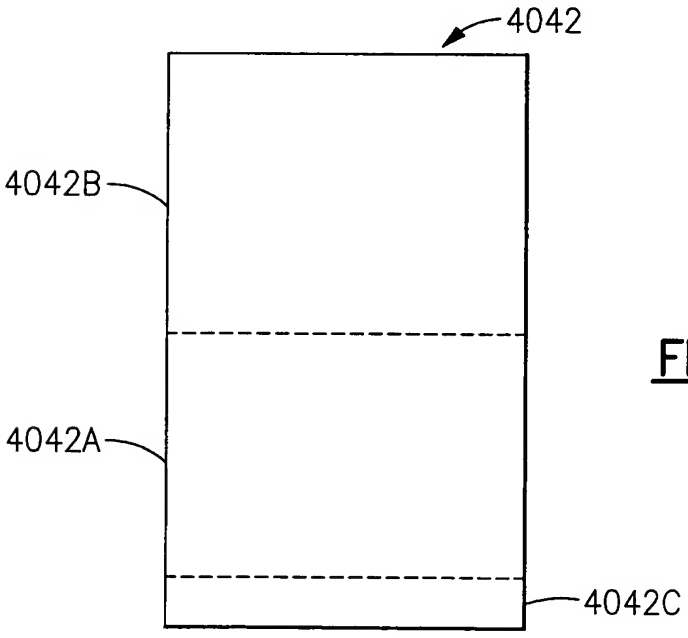

4042
4042B
4042A
4042C

FIG.36

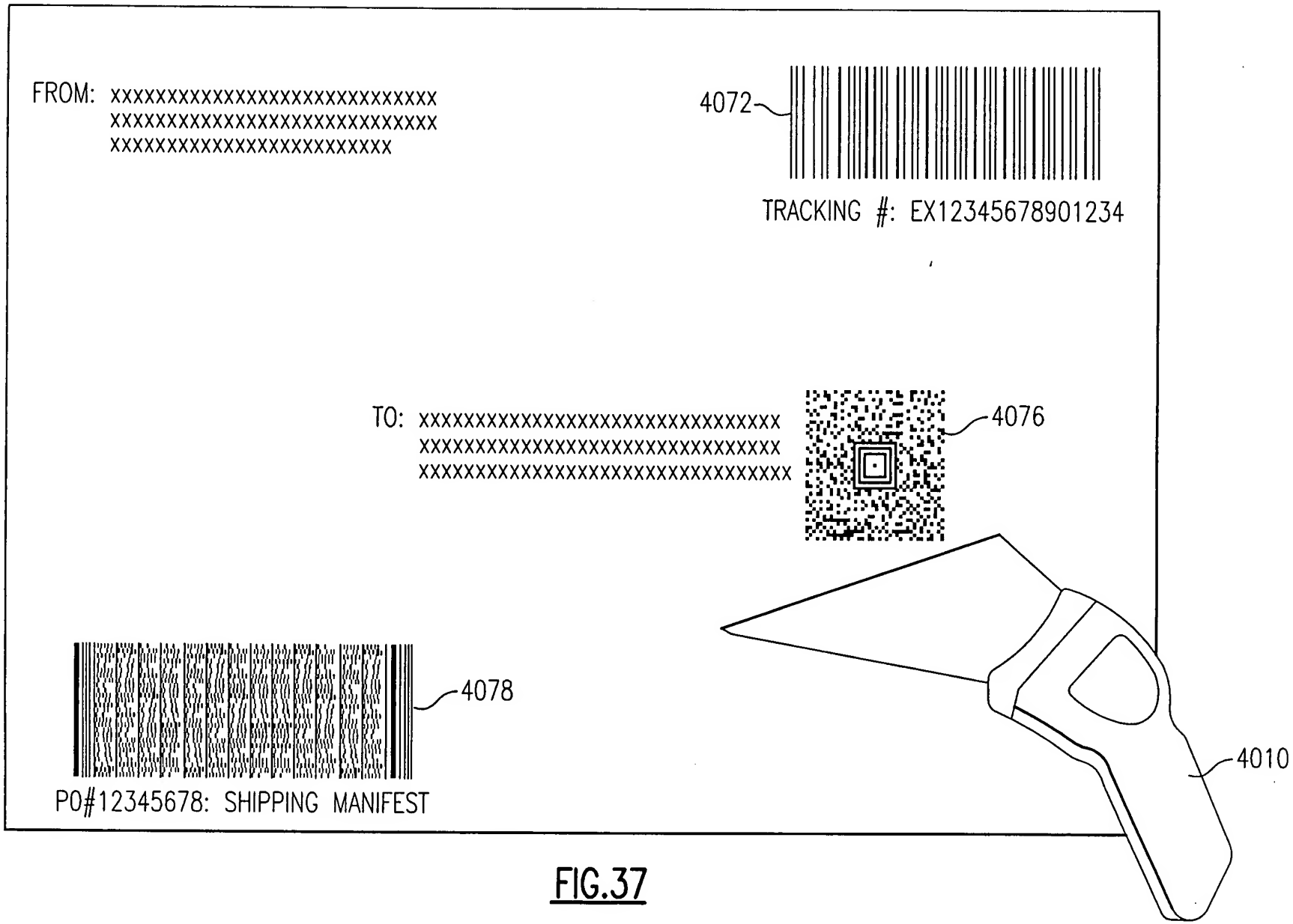


FIG.37

Express Mail Label No. EV317007417 US
Andrew Longacre, Jr. et al.
For: Optical Reader Having Solid-State Image Sensor
Our Docket No.: 703-006.50.24
Telephone: (315) 425-9000

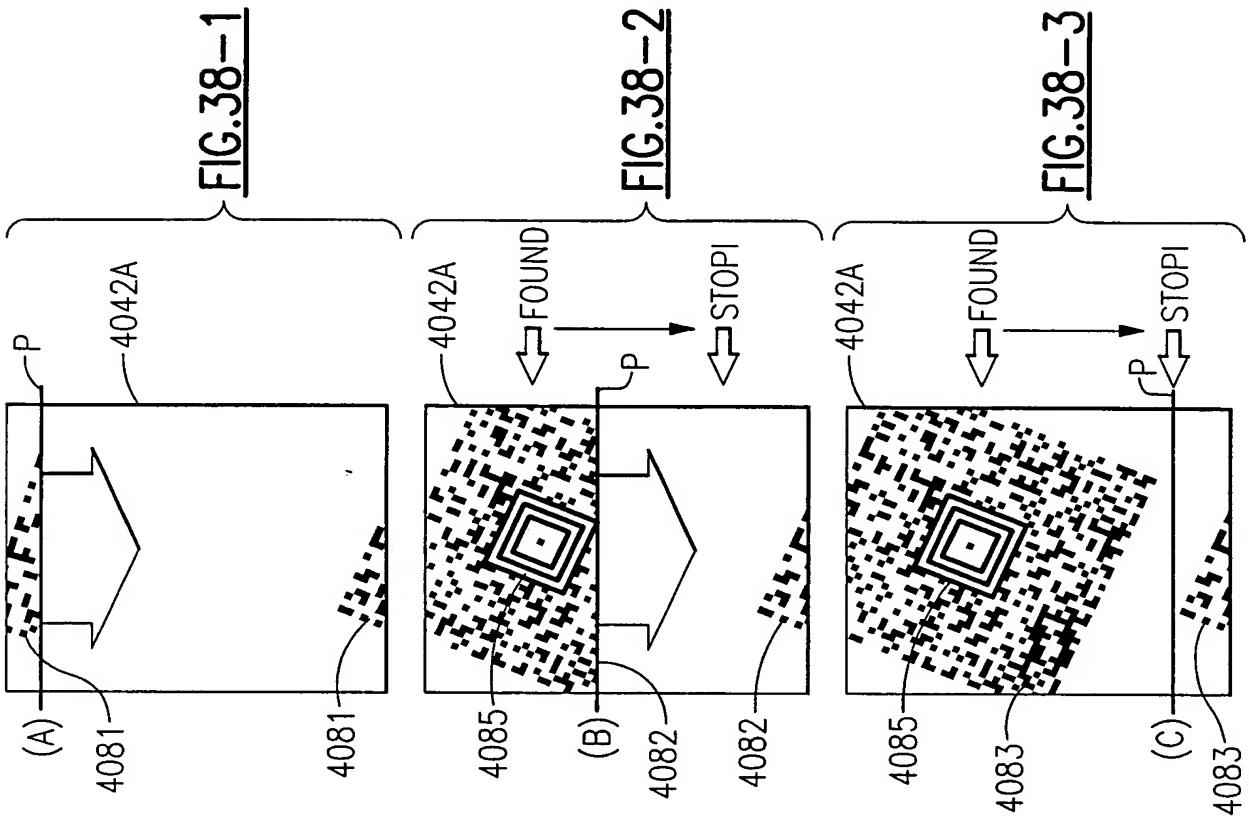
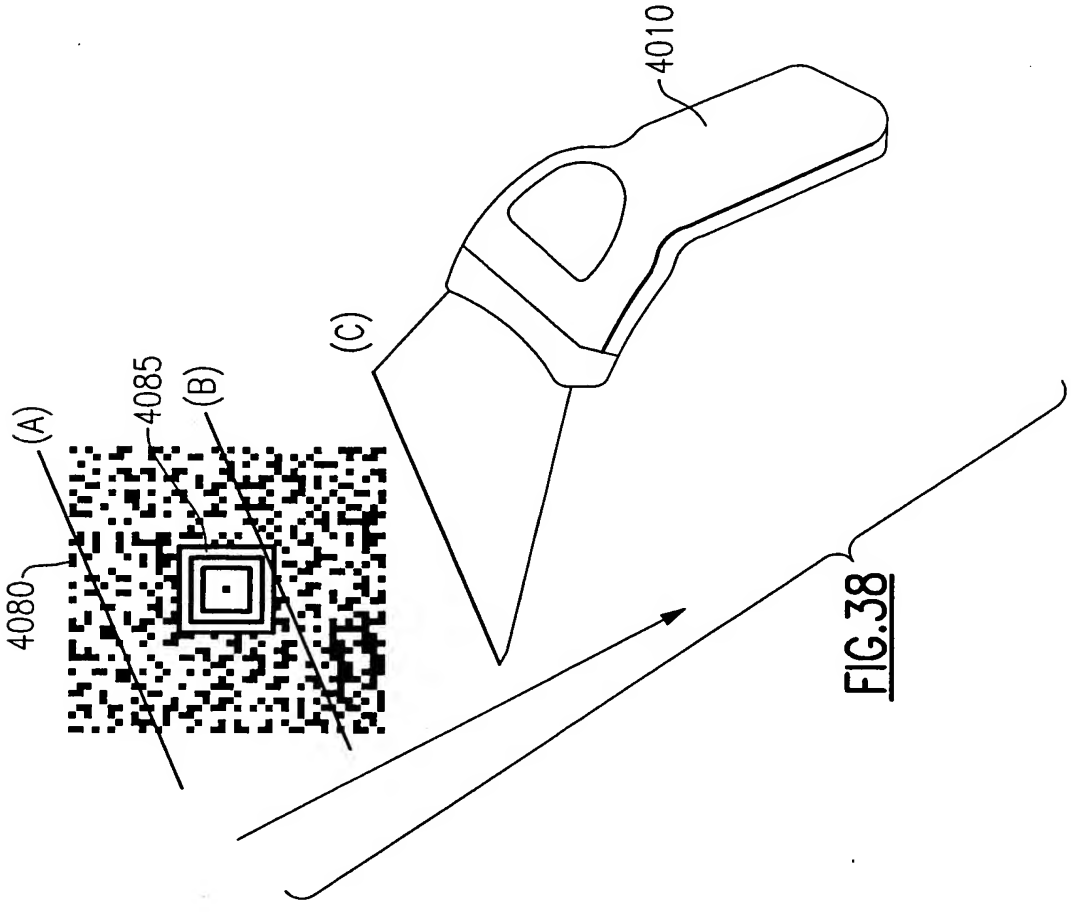


FIG.38-1
P
4042A
(A)
4081
4081
FIG.38-2
4042A
FOUND
STOPI
P
4085
(B)
4082
4082
FIG.38-3
4042A
FOUND
STOPI
P
4085
4083
(C)
4083


4010
(C)
(A)
4085
(B)
4080
FIG.38

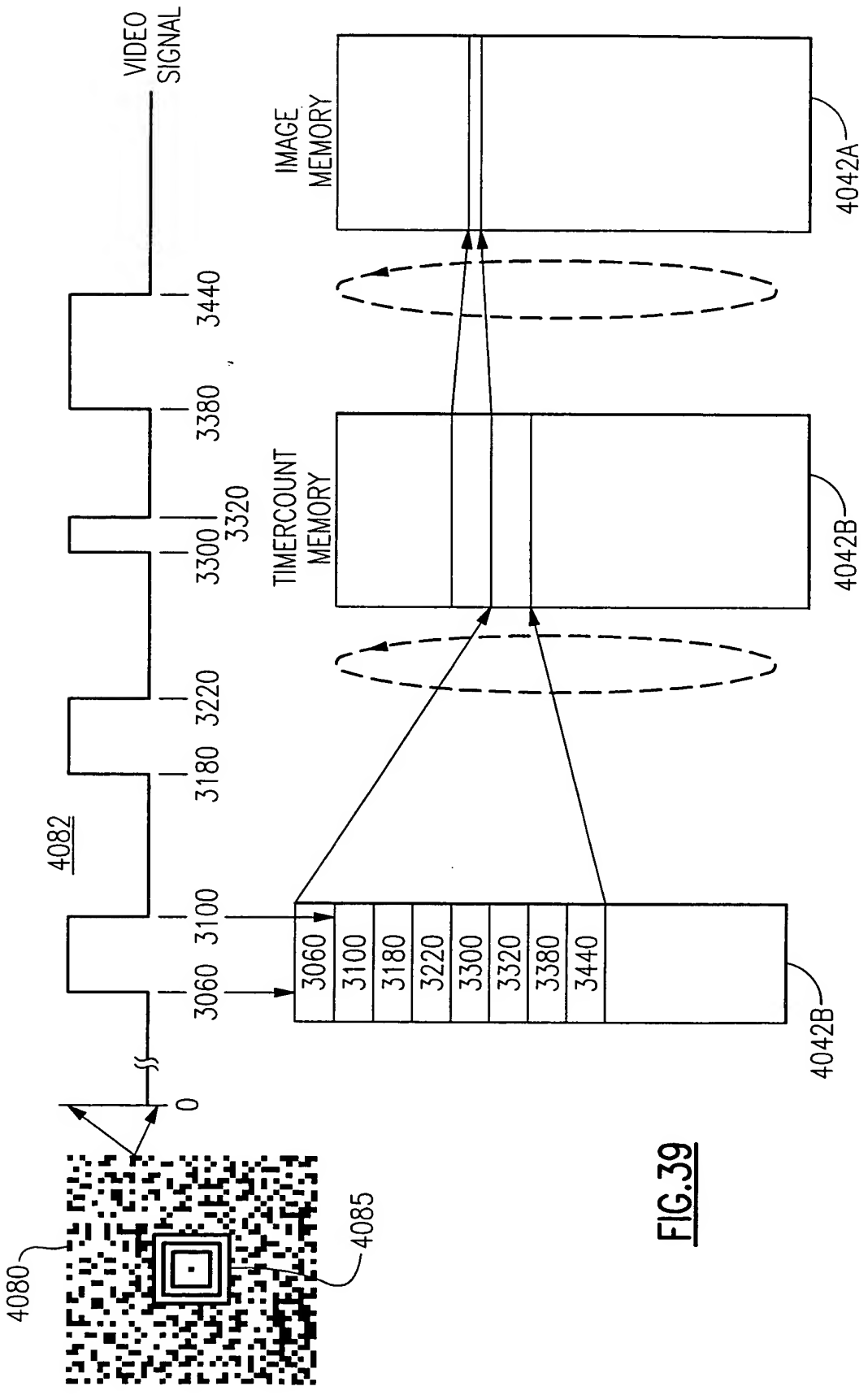

VIDEO SIGNAL
4082
0
3060
3100
3180
3220
3300
3320
3380
3440
IMAGE MEMORY
4042A
TIMERCOUNT MEMORY
4042B
4042B
4080
4085

FIG.39

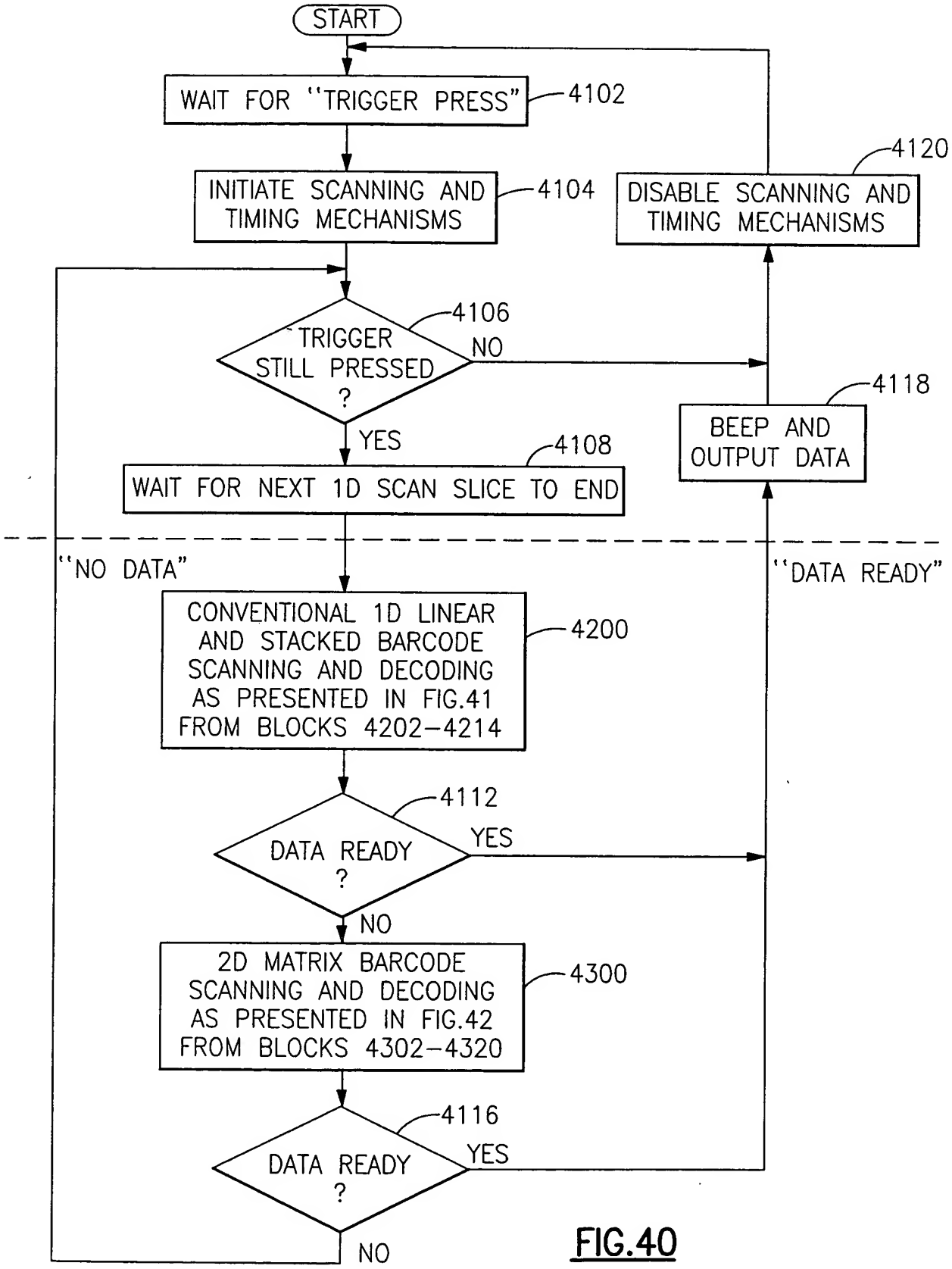

START
WAIT FOR "TRIGGER PRESS"
4102
INITIATE SCANNING AND TIMING MECHANISMS
4104
TRIGGER STILL PRESSED ?
4106
NO
YES
WAIT FOR NEXT 1D SCAN SLICE TO END
4108
"NO DATA"
CONVENTIONAL 1D LINEAR AND STACKED BARCODE SCANNING AND DECODING AS PRESENTED IN FIG.41 FROM BLOCKS 4202–4214
4200
DATA READY ?
4112
YES
NO
2D MATRIX BARCODE SCANNING AND DECODING AS PRESENTED IN FIG.42 FROM BLOCKS 4302–4320
4300
DATA READY ?
4116
YES
NO
"DATA READY"
BEEP AND OUTPUT DATA
4118
DISABLE SCANNING AND TIMING MECHANISMS
4120

FIG.40

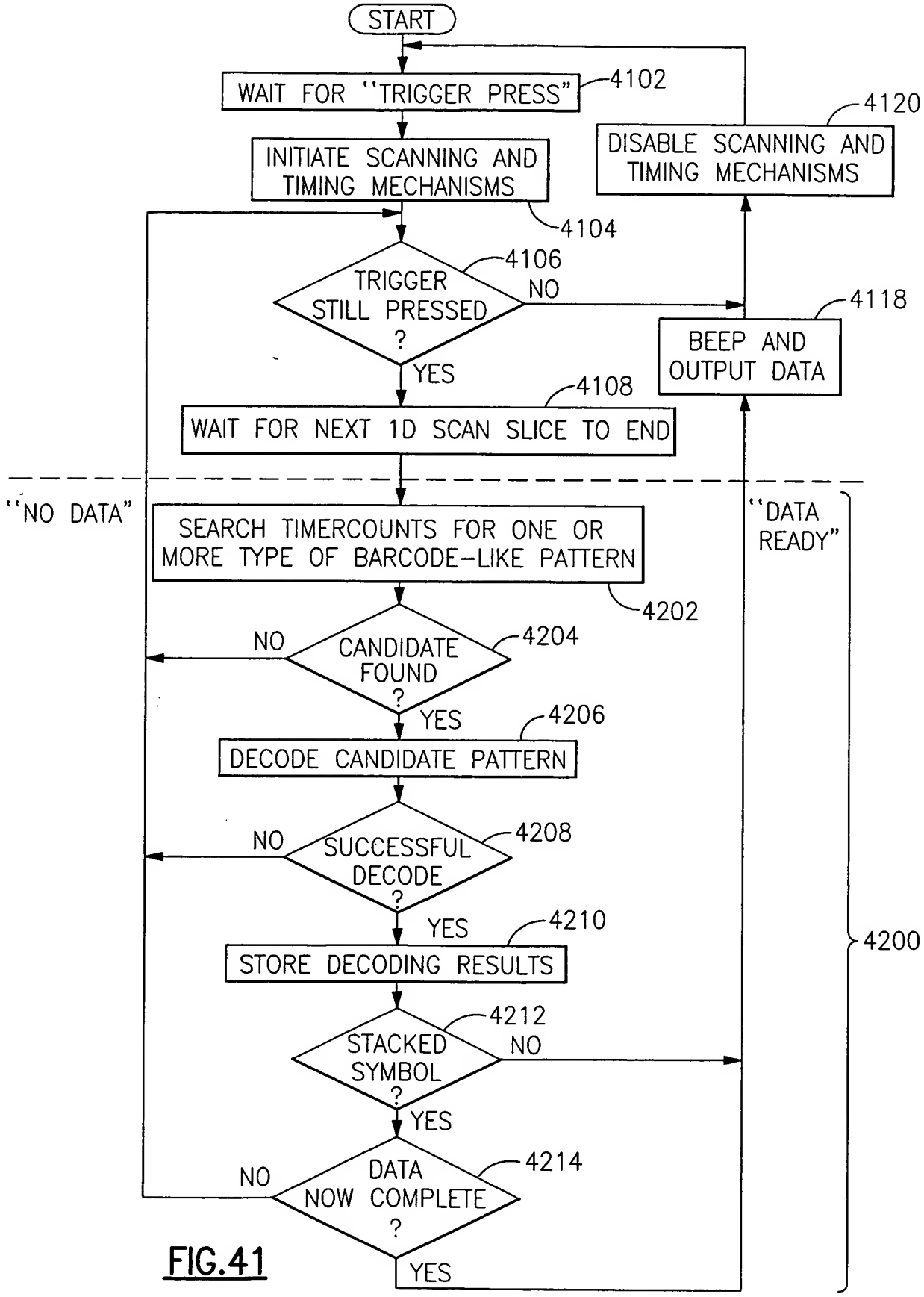

START
WAIT FOR "TRIGGER PRESS"
4102
INITIATE SCANNING AND TIMING MECHANISMS
4104
TRIGGER STILL PRESSED ?
4106
NO
YES
DISABLE SCANNING AND TIMING MECHANISMS
4120
BEEP AND OUTPUT DATA
4118
WAIT FOR NEXT 1D SCAN SLICE TO END
4108
"NO DATA"
"DATA READY"
SEARCH TIMERCOUNTS FOR ONE OR MORE TYPE OF BARCODE-LIKE PATTERN
4202
CANDIDATE FOUND ?
4204
NO
YES
DECODE CANDIDATE PATTERN
4206
SUCCESSFUL DECODE ?
4208
NO
YES
STORE DECODING RESULTS
4210
STACKED SYMBOL ?
4212
NO
YES
DATA NOW COMPLETE ?
4214
NO
YES
4200

FIG.41

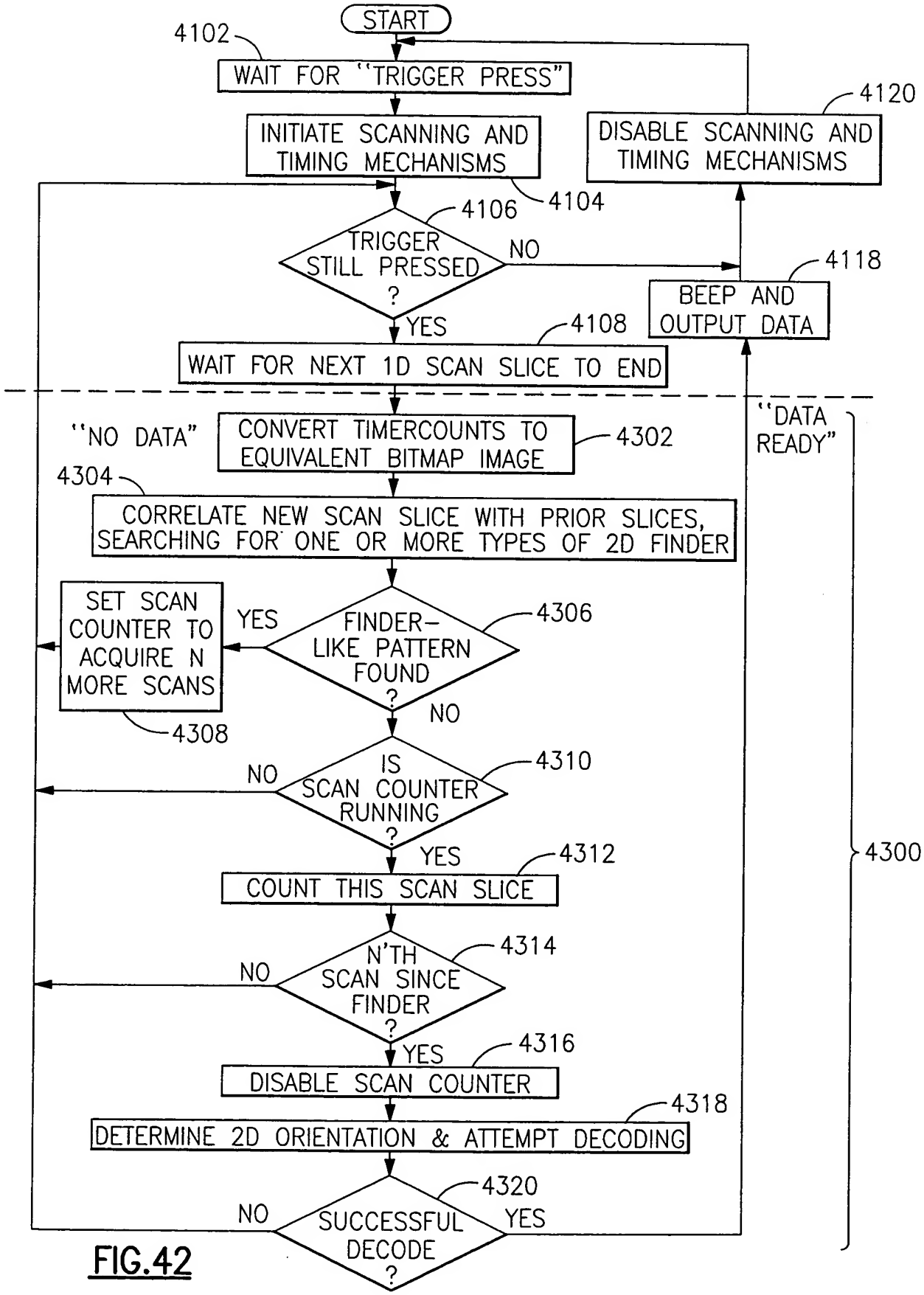

START
4102
WAIT FOR "TRIGGER PRESS"
INITIATE SCANNING AND TIMING MECHANISMS
4104
4106
TRIGGER STILL PRESSED ?
NO
YES
4108
WAIT FOR NEXT 1D SCAN SLICE TO END
4118
BEEP AND OUTPUT DATA
4120
DISABLE SCANNING AND TIMING MECHANISMS
"NO DATA"
"DATA READY"
CONVERT TIMERCOUNTS TO EQUIVALENT BITMAP IMAGE
4302
4304
CORRELATE NEW SCAN SLICE WITH PRIOR SLICES, SEARCHING FOR ONE OR MORE TYPES OF 2D FINDER
FINDER-LIKE PATTERN FOUND ?
4306
YES
NO
SET SCAN COUNTER TO ACQUIRE N MORE SCANS
4308
IS SCAN COUNTER RUNNING ?
4310
NO
YES
4312
COUNT THIS SCAN SLICE
N'TH SCAN SINCE FINDER ?
4314
NO
YES
4316
DISABLE SCAN COUNTER
4318
DETERMINE 2D ORIENTATION & ATTEMPT DECODING
SUCCESSFUL DECODE ?
4320
NO
YES
4300

FIG.42

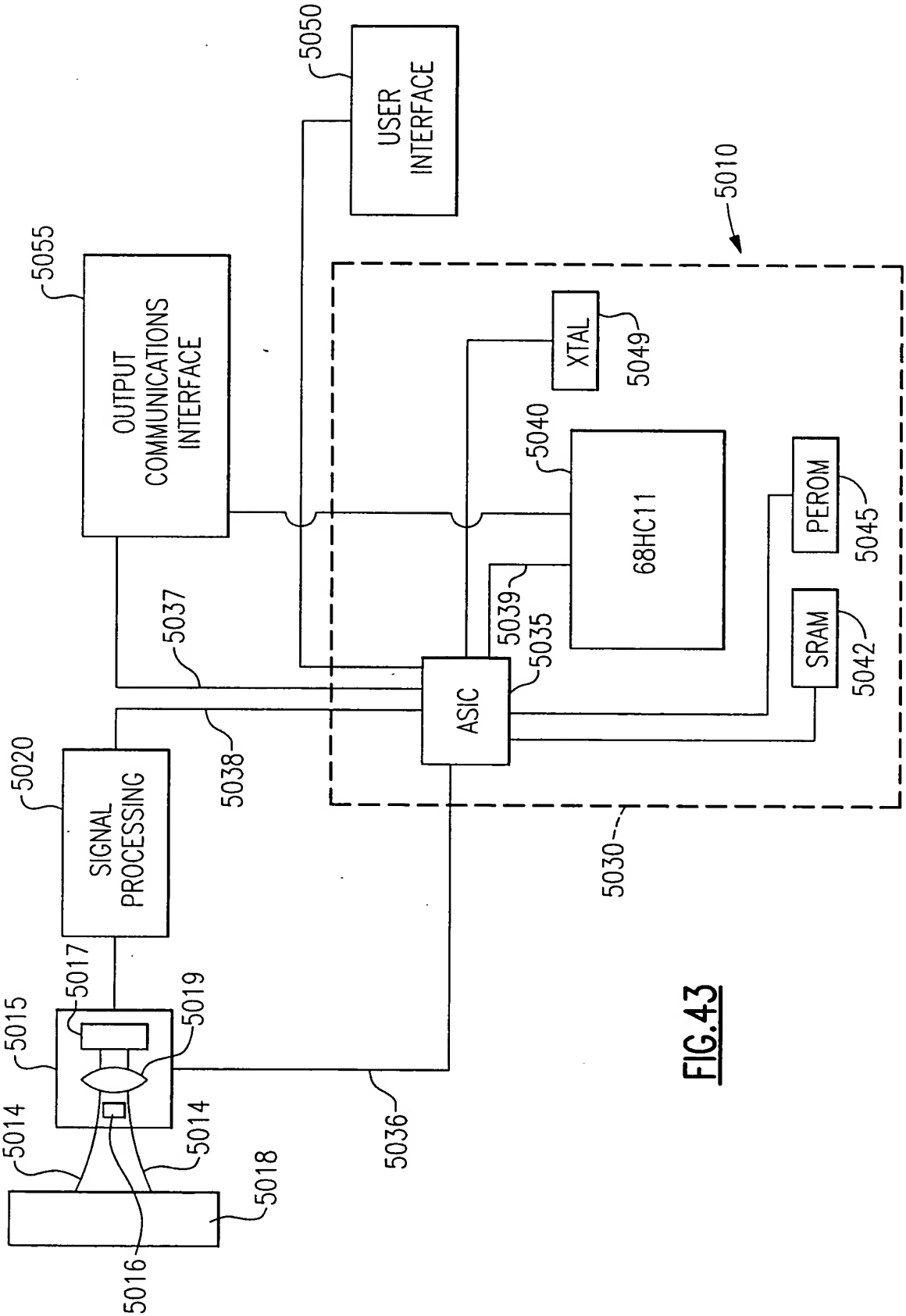

5050
USER INTERFACE
5010
5055
OUTPUT COMMUNICATIONS INTERFACE
XTAL
5049
5040
68HC11
PEROM
5045
5037
5039
5035
SRAM
5042
ASIC
5020
SIGNAL PROCESSING
5038
5030
5017
5015
5019
5014
5014
5018
5036
5016

FIG.43

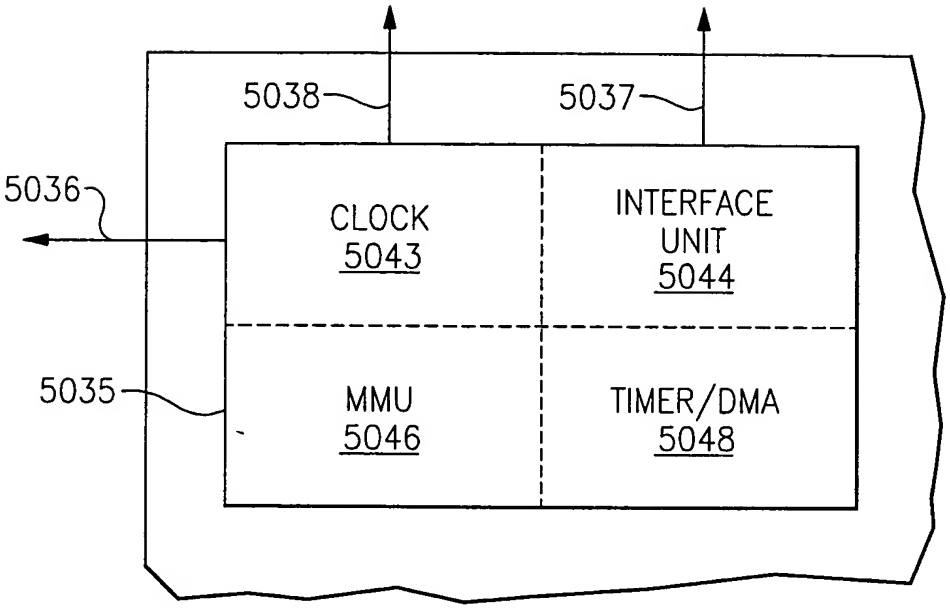

5038
5037
5036
CLOCK
5043
INTERFACE
UNIT
5044
5035
MMU
5046
TIMER/DMA
5048

FIG.44

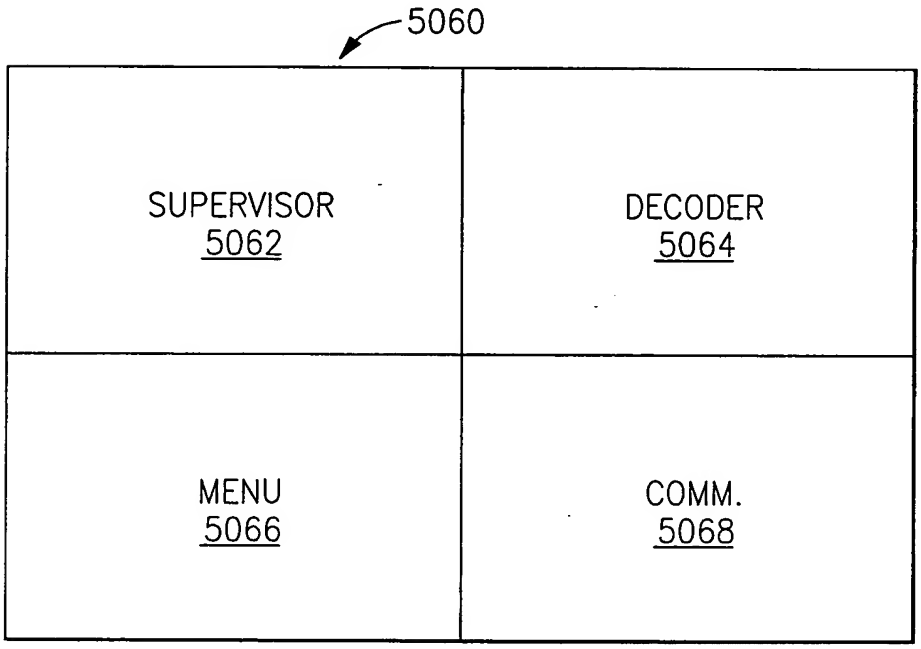
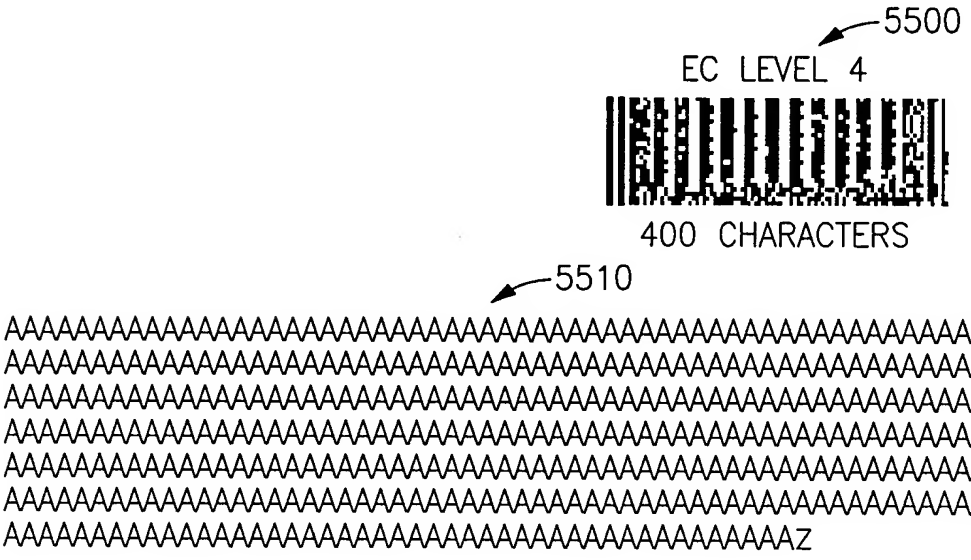
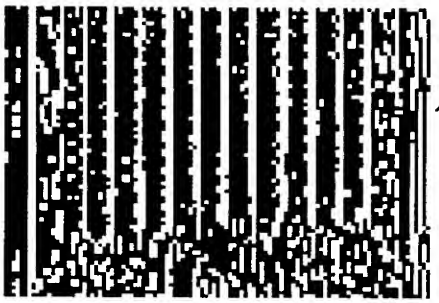

5060
SUPERVISOR
5062
DECODER
5064
MENU
5066
COMM.
5068

FIG.45

FIG.46


5500
EC LEVEL 4
400 CHARACTERS
5510
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

EC LEVEL 6



5600

800 CHARACTERS

5610

AAAA

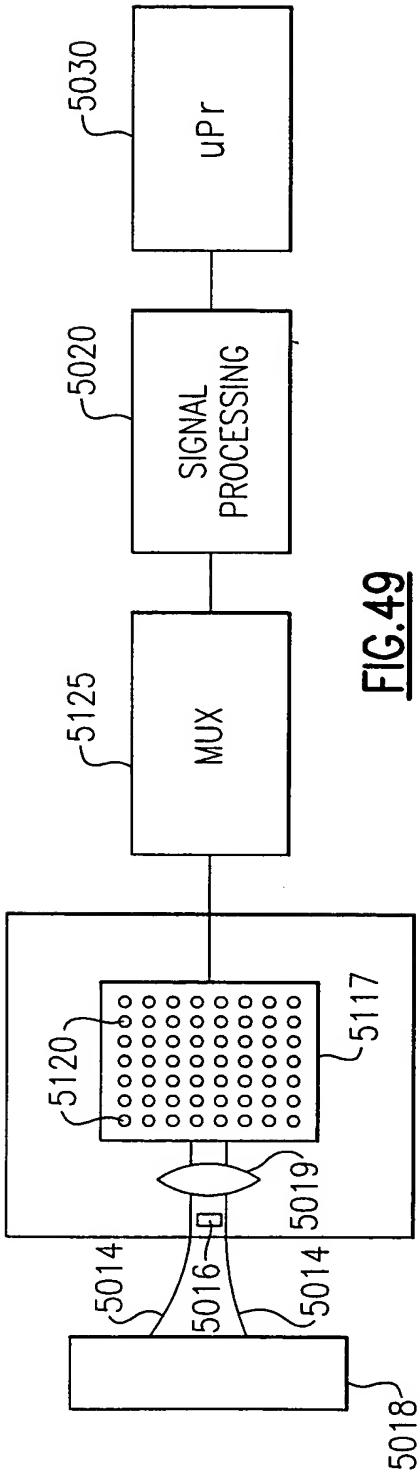

5030
uPr
5020
SIGNAL PROCESSING
5125
MUX
5120
5117
5019
5014
5016
5014
5018

FIG.49

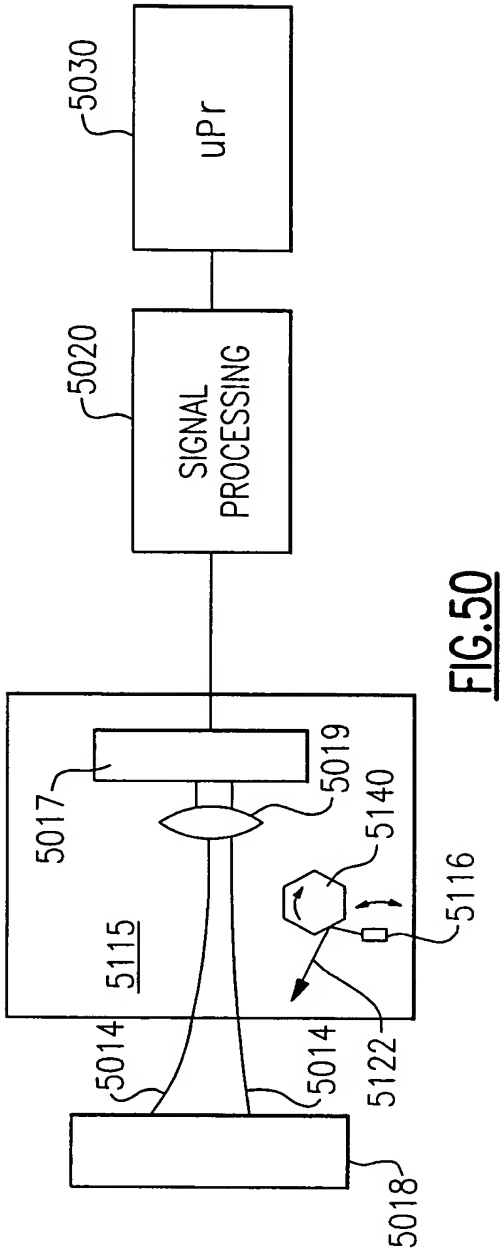

5030
uPr
5020
SIGNAL PROCESSING
5017
5019
5140
5116
5115
5014
5014
5122
5018

FIG.50